A Thesis in General Surgery

POSSUM SCORING IN HOLLOW VISCUS PERFORATION.

Submitted in partial fulfilment of the
Requirements for the Degree of
M.S General Surgery
(Branch I)

Kilpauk Medical College

TheTamilnadu Dr. M.G.R Medical University

Chennai

April 2016

DECLARATION BY THE CANDIDATE

I **Dr. GEETHA PRIYA** solemnly declare that this dissertation titled

"POSSUM SCORING IN HOLLOW VISCOUS PERFORATION" is a bonafide and genuine work done by me under the guidance of DR. R. Kannan,M.S., Professor, Department of General Surgery, Kilpauk Medical College, Chennai.This dissertation is submitted to THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI in partial fulfillment of the requirements for the degree of M.S. General Surgery examination to be held in April 2016.

Date :

Place : **Dr. S. Geethapriya.**

CERTIFICATE BY THE GUIDE

This is to certify that the Dissertation titled **"POSSUM SCORING IN HOLLOW VISCUS PERFORATION"** of **Dr. GEETHAPRIYA. S** is a bonafide work done by

Dr. S. Geethapriya Post Graduate in M.S. General Surgery, Kilpauk Medical College, Chennai under my direct guidance and supervision in my satisfaction, in partial fulfillment of the requirements for the degree of **M.S. General Surgery.**

Date :

Place:

Dr. R. Kannan M.S.,

Professor,
Department of General Surgery,
Kilpauk Medical College,
Chennai-10.

ENDORSEMENT BY THE HOD AND HEAD OF THE INSTITUTION

This is to certify that the dissertation titled "**POSSUM SCORING IN HOLLOW VISCUS PERFORATION**" is a bonafide research work done by **Dr.S.Geethapriya,** Post Graduate in M.S. General Surgery, Kilpauk Medical College, Chennai under the guidance of **Dr.R.Kannan M.S.,** Professor, Department of General Surgery, Kilpauk Medical College, Chennai.

Dr.P.N.Shanmugasundaram M.S.,	**Dr.R.NarayanaBabu M.D.,DCH**
Professor and Head, Department of General Surgery, Kilpauk Medical College, Chennai-10	Dean, Kilpauk Medical College Chennai-10
Date:	Date:
Place:	Place:

INSTITUTIONAL ETHICAL COMMITTEE
GOVT.KILPAUK MEDICAL COLLEGE,
CHENNAI-10
Protocol ID.No.15/11/2014
CERTIFICATE OF APPROVAL

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval "Possum Scoring in Hollow Viscus Perforation" - For Project Work submitted by Dr.S.Geethapriya, MS (GS) Post Graduate, Department of General Surgery, Kilpauk Medical College, Chennai-10.

The Proposal is APPROVED.

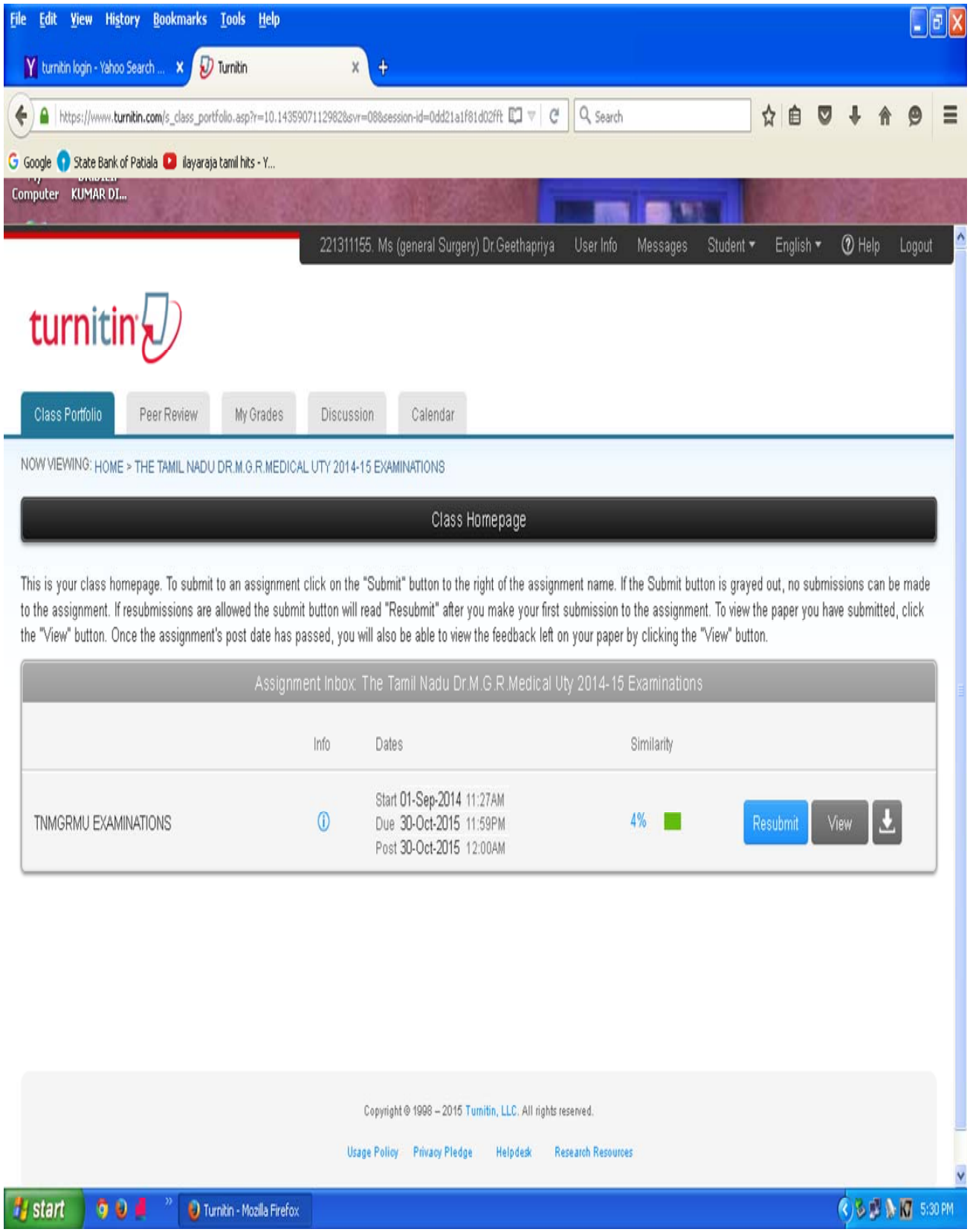
The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

10/6/15

CHAIRMAN,
Ethical Committee
Govt.Kilpauk Medical College,Chennai

o/c 10/6/15

My Comp<E Colon< ME 1 Sec> Ethical Committee


File Edit View History Bookmarks Tools Help
turnitin login - Yahoo Search ...
Turnitin
https://www.turnitin.com/s_class_portfolio.asp?r=10.1435907112982&svr=088&session-id=0dd21a1f81d02fft
Search
Google
State Bank of Patiala
ilayaraja tamil hits - Y...
Computer
KUMAR DI...
221311155. Ms (general Surgery) Dr.Geethapriya
User Info
Messages
Student
English
Help
Logout
turnitin
Class Portfolio
Peer Review
My Grades
Discussion
Calendar
NOW VIEWING: HOME > THE TAMIL NADU DR.M.G.R.MEDICAL UTY 2014-15 EXAMINATIONS
Class Homepage
This is your class homepage. To submit to an assignment click on the "Submit" button to the right of the assignment name. If the Submit button is grayed out, no submissions can be made to the assignment. If resubmissions are allowed the submit button will read "Resubmit" after you make your first submission to the assignment. To view the paper you have submitted, click the "View" button. Once the assignment's post date has passed, you will also be able to view the feedback left on your paper by clicking the "View" button.
Assignment Inbox: The Tamil Nadu Dr.M.G.R.Medical Uty 2014-15 Examinations
Info
Dates
Similarity
TNMGRMU EXAMINATIONS
Start 01-Sep-2014 11:27AM
Due 30-Oct-2015 11:59PM
Post 30-Oct-2015 12:00AM
4%
Resubmit
View
Copyright © 1998 – 2015 Turnitin, LLC. All rights reserved.
Usage Policy
Privacy Pledge
Helpdesk
Research Resources
start
Turnitin - Mozilla Firefox
5:30 PM

ACKNOWLEDGEMENT

My sincere thanks to Prof. Dr. R.NarayanaBabu, M.D., DCH, Dean, Kilpauk Medical College and Hospital for allowing me to conduct this studyin the Department of General Surgery, Government Royapettah Hospital, Chennai.

I am extremely grateful to Dr.P.N.Shanmugasundaram, M.S, Professor and Head Of the Department of General Surgery, Government Kilpauk Medical college for his encouragement and permission in granting unrestricted access to utilizing the resources of the Department.

I thank my mentor and guide Dr.R.Kannan, M.S, Professor of General Surgery, GovernmentRoyapettah Hospital for his valuable guidance during the tenure of my course.

I thank my Professors Dr.S. Balakrishnan ,Dr. V.Ramalakshmi, Dr. V.Chitra and Dr. R.A.Pandiyaraj, for their support and guidance.

I also acknowledge my assistant professors Dr. Rosy Adhalineselvi, Dr.B.N.Kalaiselvan, Dr. Padmanaban for their valuable support and timely help rendered to complete this study.

I thank my family for their great help and support.

I am particularly thankful to my fellow postgraduate colleagues for their valuable support in the time of need throughout this study. Last but not the least I would like to thank my patients with gratitude for their cooperation in this study.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

POSSUM: physiologic and operative severity score for enumeration of mortality and morbidity.

P-POSSUM: Portsmouth predictor modification.

O.mort: Observed mortality

O.morb: Observed morbidity

P.mort: Predicted mortality by POSSUM

P.morb: Predicted morbidity by POSSUM

PP.mort: Predicted mortality by p-possum

T.B ABDOMEN: Tuberculosis abdomen

FAI: fire arm injury

PID: Pelvic inflammatory disease

OPD: out door patients

C.A: carcinoma

T.B:tuberculosis

UTI:urinary tract infection

LIST OF TABLES

LIST OF FIGURES

1. ABSTRACT:

Mortality and morbidity is an important and objective measure of outcome of a surgery. The outcome of surgical intervention is not solely dependent on the abilities of surgeon in isolation. The patients physiological status, disease that requires surgical corrections, severity of the diseases, the nature of the operation and the preoperative and postoperative support services have a major effect on the ultimate outcome.

This POSSUM scoring (physiological and operative severity score for enumeration of mortality and morbidity) uses of the physiological and surgical variables which is a quick, noninvasive, easy to use and can be applied both in emergency and elective surgery and accurately in predicting the outcome.

AIM:

Aim is to predict the risk of mortality and morbidity in patients with peritonitis due to hollow viscous perforation. Assessment of surgical risk in these patients is to help in choosing the modality of post operative management in a particular patient.

PERIOD OF STUDY: Nov 2014 - June 2015

MATERIALS AND METHODS:

50 patients with hollow viscous perforation admitted in Government Royapettah Hospital, Kilpauk Medical College Hospital from November 2014 to June 2015 were

included in the study. Necessary date to be collected: POSSUM SCORE were to be calculated for each patient and analysis to be done.

RESULTS:

Based on my study, POSSUM can be used as a good stratification tool for predicting morbidity and mortality within 30 days from the operative day. One of the limitation in POSSUM is that it over predicts mortality in some low risk patients but prediction of morbidity is better. POSSUM scoring system is well validated for its use in risk adjusted auditing in general surgery.

2. INTRODUCTION

The notion that every surgeon is accountable for the outcome of the patient has been continuing from ancient times. But the outcome of the patient is dependent on the surgeon but also the patient and his clinical condition. His acute and chronic physiological status, present pathological condition for which he is being treated and its severity, nature of surgical intervention and the other comorbid condition are also quite important for assessing the overall outcome of the patient. Doctors, especially surgeons are increasingly accountable for their actions to their own professional organizations through re-validation and also to media, the government, and thepopulation which we serve.

Since the introduction of NHS plan (National health services), it has become more important to show that one is following an evidence based medicine and also that one is striving to perform towards the national standards of practice. Since the mortality and morbidity not dependent solely on the surgeon, comparative surgical audit can be misleading for emergency cases between different hospitals.

There are limited indicators of quality of hospital care for surgical patients like crude morbidity and mortality which can be misleading when results are compared between different hospitals.Meaningful analysis of morbidity and mortality before treatment can be achieved by scoring systems.

The Physiological and Operative severity score for the enumeration of mortality and morbidity (POSSUM) developed by Copeland et al in 1991, provides a valuable tool for risk adjustment and stratification and this is widely used in various surgical settings.In a surgical review article it was concluded that 'POSSUM scoring is the best scoring system available in surgical practice.It scores the physiological status of patients and operative findings and all 12 physiological and 6 operative variables can be recorded easily and reproduced satisfactorily

by resident staff without any difficulty. It is widely used by the surgeons compared to anesthetists who use ASA and APACHE scoring system.

The main disadvantage of POSSUM scoring is that it over predicts the mortality in some low risk patients. The Portsmouth predictor {P-POSSUM} modification proposed by Whiteley et al. counters this over prediction of mortality by POSSUM. It uses the same variables as POSSUM but uses a different formula for analysis.

3. AIMS AND OBJECTIVES

POSSUM scoring system has been validated and it is extensively used in surgery and subspecialities like vascular, surgical gastroenterology, orthopedics, colorectal, pulmonary surgeries. But its use in emergency settings has not been studied extensively.

Hence the aim of my present study was

1. To determine the value of POSSUM scoring in predicting the mortality and morbidity patients undergoing emergency surgery in tertiary care unit.

2. To study the morbidity and mortality of patients undergoing surgery for hollow viscous perforation.

Using these scores as a valuable tool for surgical audit,quality of health care system in local health system can be studied.

4. REVIEW OF LITERATURE.

4.1. BASIC APPROACH TO A PATIENT WITH ACUTE ABDOMEN

There are many conditions that causes an acute abdominal pain and among which hollow viscous perforation forms a major burden of this condition. Generalized grouping of this condition includes

1. Perforated hollow viscous.
2. Ischemia of intestinal tract.
3. Intra-abdominal or retroperitoneal hemorrhage.
4. Obstructed hollow viscous.
5. Acute intra-abdominal or retroperitoneal inflammation.
6. Non-GI causes of abdominal pain.
7. Factitious causes of abdominal pain.

Airway, breathing, circulation needs to be addressed as in all critical patients. As suchairway obstruction are seldom associated with acute abdominal pain but patients with distended abdomen may occasionallyhave ventilatory compromise which may be precipitated by pre-existing pulmonary disease and acidosis and hypotension. Almost all patients with acute abdomen will have a compromised blood volume can result in a recognizable picture of decompensated hypovolemic shock, with pallor, diaphoresis, and cool and mottled extremities. Patients with acute onset of abdominal pain should always be examined carefully for compensated loss of blood volume, looking for blood pressure, collapsed peripheral veins, absence of jugular filling, poor quality peripheral pulses, cool

skin, and slow capillary refill. Patients who are critically ill should always be stabilized or shifted to the theatre once clinical condition deteriorates inspite of resuscitatory measures. Monitoring of such patients would consists of ECG, saturation monitoring, blood pressure and pulse rate.

CLINICAL ASSESSMENT OF PATIENTS WITH PERFORATED VISCUS:

There are variable degrees of risk and the time period with which the diagnosis and management occur is important in case of a hollow viscous perforation. The outcome of such patients varies with the site of perforation. The major issue influencing the outcome of early management is the degree to which the perforation has been contained or localized by peritoneal defense mechanismss

1. It could be a peptic ulcer perforation which can be contained or it could have a free perforation with extravasation of air in the peritoneum.
2. It could be a appendicular perforation with ongoing peritonitis or it can be localized with abscess formation.
3. A diverticular perforation with abscess formation can also occur.

PERFORATED VISCUS

Conditions included in this scenario are those encountered in adults, between the esophagogastric junction and the rectum. A perforation may be contained to a variable

extent by omentum, other loops of adjacent intestine and mesenteries, and its spread throughout the abdomen may be prevented by these physiologic barriers by body's defense mechanisms. Other perforations may rapidly overwhelm the peritoneal defenses and allow the rapid spread of intestinal content causing features of peritonitis throughout the abdomen. Some portions of the gastrointestinal tract will be in the retroperitoneum. These would include the ascending and descending colon and the duodenal loop. Perforations in these part of the intestinal wall from diverticula, for example, may lead to spreading infection but within the retroperitoneum.

PERFORATIONS IN THE ESOPHAGUS, STOMACH AND DUODENUM

1. Perforation of oesophago-gastric junction

Perforations of the esophagus may occur into the mediastinum or pleural space. Occasionally the perforation or rupture is at the esophagogastric junction, and both pleural and peritoneal cavities may be involved. Rarely, the contamination can occur entirely below the diaphragm. Attempts to dilate strictures or pass feeding tubes with stylets, or even iatrogenic perforation can occur with endoscopy; violent vomiting has been implicated in some cases.

2. Peptic Ulcers

Peptic ulcers are the most common identified cause of perforations in the stomach and also duodenum. Perforations of duodenal ulcers are more common noticed than gastric ulcers. Perforating duodenal ulcers are usually seen on the anterior wall of the first part of the duodenum. Ulcers which are posterior penetrate into the retroperitoneal tissues, mostly the pancreas. They provoke an adjacent inflammatory reaction, which may prevent diffuse peritoneal spread of infection.

Anteriorly placed ulcers in the duodenum which perforate are often small. Containment initially is frequently poor, however acid gastric contents and duodenal contents frequently spread widely within hours throughout the peritoneal cavity. The gastric and duodenal contentscause chemical irritation of the peritoneum which triggers the classic board like rigidity often described in perforated peptic ulcers. Rebound is hard to elicit in such patients in spite of the wide spread peritoneal irritation, because of the rigidity of the abdominal wall. Percussion will demonstrate the peritoneal contamination, however. After some time, there may be some softening of the abdominal wall, but diffuse tenderness and considerable guarding usually persists. Peptic ulcers which are in the stomach are considerably larger compared to that in the duodenum. Vomiting is uncommon. Stomach ulcers with perforation usually spread to lesser sac. And as a general rule perforations in the anterior stomach usually perforate and the one present posteriorly bleed.

These patients characteristically experience sudden onset of pain which is often localized to upper abdomen. Features of peritonitis sets in rapidly. These patients usually have stable vital signs but presents with extreme discomfort particularly while moving. Breathing will be shallow and there will be no movement of abdominal wall with respiration. Occasionally when there is a significant pneumoperitoneum liver dullness may be obliterated. In more than 75% of the patients pneumoperitoneum will be present in X-ray abdomen erect.

The management, once the diagnosis is confirmed an emergency exploratory laparotomy is performed. If perforation in the anterior wall of the duodenum is found, the best management is to seal the perforation with anomental patch described by Roscoe Graham. Attempts to sew the ulcer and close it or to imbricate it usually fail because of the cartilaginous and rigid nature of the tissue immediately adjacent to the perforation. The omental patch should be always secured carefully over the perforation and sutured around the periphery of the patch and also to the muscular coats of the duodenum and truly should appear like an omental “patch”. In ulcers that are very large more than one centimeter in which a patch is not a feasible solution, very often difficulties are encountered. Gastrectomy is usually preferred in such case followed by considerable morbidity and the risk of leakage of the duodenal stump is common. Attempts to attain controlled drainage of these large perforations may not be entirely successful.

If the perforation is present in the distal stomach and is due to a large gastric ulcer, a distal gastrectomy is the best solution. More proximal large gastric ulcers which perforate and pose a great challenge to the surgeons, since they would require a very significant gastrectomy to resect them and often they occur in debilitated and also elderly patients. Some of these can be excised in the margin and the stomach repaired. There is alsoincreased risk that these large gastric located proximally ulcers may be malignant.

DIVERTICULAR PERFORATION

As such duodenal diverticular perforation is very rare. A diverticulum is mostly an incidental finding while doing endoscopy of upper GI tract or in contrast studies. Rarely this may perforate into the retro peritoneum and can be lethal even before diagnosis. Perforation of Meckel's diverticulum secondary to inflammatory reaction can simulate an acute appendicitis. These are usually poorly contained and widespread contamination usually occurs quickly. Management is resection of the involved segment although in some cases diverticulectomy can be tried if inflammatory changes are mild.

PERFORATIONS OF SMALL BOWEL

Perforation of the small bowel may the result of Meckel's diverticulum, ischemia, inflammatory disease, infections or primary or metastatic neoplasm . Ischemia or infarction of the small bowel is considered the most common reason for perforation. A short segment of ischemia may be missed for some period of time and may present as a small bowel obstruction. Eventually the gangrenous part of small bowel begins to leak and peritonitis evolves.Meckel's diverticulum is a rare condition in adults, but occasionally presents with bleeding or Meckel's diverticulitis. Usually the presentation simulates anacute appendicitis or perforated appendix. Foreign bodies may occasionally perforate the small bowel if they are trapped and cannot pass beyond that segment of bowel. Inflammatory bowel disease (Crohn's disease) rarely causes perforation. A tendency of Crohn's disease is to adhere to adjacent hollow viscera and to the abdominal wall or to penetrate the wall of the adjacent gut by its deep fissuring ulcerations. Fistulae result or occasionally localized abscesses.

PERFORATION OF APPENDIX

Perforation of appendix is usually a slow process and it is more common in adultpopulation. The result of this appendicular perforation is a contained abscess in the form of either pelvic or right iliac fossa abscess. The characteristic history of appendicitis is usually not present, leading to a delay in diagnosis. The patient may not

present in a timely manner. The history usually dates for several days, or even in some cases weeks. It is infrequent that free air is seen in the abdomen in cases of appendicitis, as in most cases the proximal appendix is obstructed either by lymphatic tissue or fecalith.

Perforation in the Colon

Perforation of colon may result from diverticular disease. Neoplasms of the colon, either directly through the malignant tumor, or by rupture due to distal obstruction. Occasionally foreign bodies, ischemia, or inflammatory bowel disease may lead to perforation. Many diverticular perforations are usually contained in the left lower quadrant. They present with left lower quadrant pain, because of an inflammatory mass, and the localized peritonitis. Mostof these patients can be managed with intravenous antibiotics. If an abscess forms which is localized this may sometimes be drained by radiologic intervention. In this manner the patient may be guided to a stage where it may be possible to do a single stage resection of the disease.

Where the perforation of colon is large and the escape of contents overwhelms the local defenses, a wide spread peritonitis occurs eventually. Individuals who are taking steroids or immunosuppressive drugs may be more vulnerable to widespread peritonitis in cases of perforation.

Neoplasms in the left colonic wall will occasionally perforate through the tumor, but this is rare. The pattern of growth of these lesions is constricting type leading to

obstruction. The proximal bowel may become markedly distended and eventually perforateif the ileocaecal valve is competent. This distension may also lead to patchy ischemia. Because of the massive fecal and gas content in the obstructed colon, cecal rupture may occasionally produce an overwhelming fecal peritonitis and eventually septic shock.

Ischemia of colon may occasionally perforate, although the process is slow. The perforation may develop so slow that the colon is completely necrotic before the condition is discovered.

Inflammatory bowel disease which may cause Toxicmegacolon, or Clostridium Difficile colitis, can lead to perforation, or at the least, a very impressive degree of tenderness and distention. Fever, tachycardia, hypotension and secondary organ failure are the rule.

COMPLICATIONS OF PERFORATED VISCUS[1].

General "Systemic" Complications

Patients with an acute abdominal features due to perforation ofviscus will suffer from general complications with severity more than those individuals presenting electively with gastro intestinal diseases. Patients presenting to emergency department are often associated with other medical conditions which leads to further complication. The complication of the disease process in the abdomen will result in "negative" secondary events such as blood volume contraction, toxemia, and bacteremia. Peritonitis, gut

distention and fecal loading of the colon will often mandate multiple, "staged" procedures which contribute to the increased morbidity.

As a general rule, complications and mortality will be higher the longer the delay period between onset of the acute symptoms and presentation for treatment and then to initiation of specific treatment after the patient has reached the facility. Studies have indicated that at least 60% of patients suffering from a specific condition, such as appendicitis, will present late. This data suggests that an unfavorable situation resulting in morbidity and mortality is often patient related.

It is unnecessary to completely review all possible systemic complications which could occur during the management of a perforated viscus. To be comprehensive, the list of complications which potentially could occur would include almost every known disease or complication in every system.

There are clearly high rates of aspiration pneumonia and nosocomial pneumonia in this group of patients. Cardiac events, including myocardial infraction, dangerous arrythmias and congestive heart failure occur with increased frequency. Because of problems with sequestration and loss of body fluids, prerenal failure is very common and may be severe if it is imposed upon previous chronic disease. The well known complications of pulmonary embolus and DVT also occur with an increased frequency.

Coagulopathy may be encountered, in the presence of acidosis, hypothermia, sepsis and liver failure. Patients may have been receiving anticoagulants for collateral cardiac and vascular disease.

States of agitation and delirium frequently develop and complicate the management of these individuals; important drains, IV lines and catheters may be pulled, patients fall, aspirate or are dangerously over-sedated.

Complications related to the peritoneal cavity

The frequency of serious complications in the abdominal cavity, retroperitoneum or wound will be very closely related to the delay in control of the ongoing contamination. Delay in presentation or in operative intervention, with extended periods of peritoneal contamination, will increase the incidence of intra-abdominal abscesses. Even though these will be drained and irrigated at operation, collections may reform post operatively, either in the same or other sites. Common locations for postoperative abscesses are the sub-phrenic spaces, sub-hepatic space or in the pelvis.

Complications related to the wound

When the peritoneal cavity is severely contaminated and access to the problem must be gained by an abdominal incision, the wound is also contaminated and the likelihood of wound problems, particularly infection and dehiscence, increases. Wound

management strategies may play an important role in the prevention of complications in this area.

Complications related to the specific procedure performed

The rate of complication in this category is related to the nature of the primary problem causing the acute abdomen. Perforation of a duodenal ulcer, operated on and sealed by an omental patch, after a quick presentation, usually has a good outcome with little likelihood of complication. If a complex surgery, with many suture lines [eg, gastrectomy] is performed, morbidity is very likely.

On the other hand, delayed presentation of a patient

with perforation of the distal small bowel or colon will be followed by serious morbidity. The higher bacterial and mechanical load of the more distal bowel and the frailty of its circulation are probably the major factors contributing to this observation.

Perforations in the descending colon will usually be managed by resection of the perforated segment with the diseased bowel [diverticulitis, ischemia, etc.] Anastomosis will not be attempted, so the patient will have an end-colostomy, usually

in the descending colon or proximal sigmoid. Only the defunctioned rectal stump is left as a potential source of leakage.

Pathology in the terminal ileum or ascending colon, leading to perforation, often is managed by right hemicolectomy, The operator will need to make a choice between an ileostomy stoma and reanastomosis to the transverse colon; frequently, the latter course is taken. Most small bowel perforations are resected and reanastomosed.

4. 2. AUDIT

SURGEONS VIEW ON AUDIT

We must formulate some method of hospital report showing as nearly as possible what the results of treatment obtained at different institution are. This report must be made out and published by each hospital in a uniform manner, so that comparison will be possible. With such report as a starting point, those interested can begin to ask questions as to management and efficiency. (Taken from lecture by Ernest Amory Codman)[7]

Surgery without an audit is like playing a game without score. {H.B. Devlin founder and director of surgical audit and epidemiological unit, Royal College of surgeons, England. Clinical audit is defined by Department of Health, UK as:

“the Systemic, critical analysis of quality of health care, including the procedures used for diagnosis and treatment, the use of resources and the final outcome and the quality of

life for the patient. It states that an effective medical audit will also give reassurance to the doctors that best quality of care is achieved" [8]

METHODS OF AUDIT[10]

Clinical audit is a process by which we analyze the patient care. Various aspects of health care are compared and if care falls in any particular criteria, then some change is undertaken to improve care which may be at hospital level or individual level.Various audits that assess in the clinical practice are as follows:

BASIC CLINICAL AUDIT: It analyses the case details and assess the complications like morbidity and mortality. Any deviation from norm is observed and steps taken to improve the clinical care.

CLINICAL RECORD REVIEW: Here a random case is selected and another firm from same specialty analyzes the clinical records to confirm whether specific standard of care is achieved in all the cases.

CRITERION AUDIT: Retrograde analysis of various clinical records and it is judged against a number of carefully chosen criteria.

It compares investigations and the treatment given.

COMPARATIVE AUDIT: It compares the various data across units and health authorities. This reasonably improves the surgical practice.

ADVERSE OCCURENCE SCREENING: It reviews various adverse outcome like complications, unplanned readmission to avoid complications in the future.

OUTCOME AUDIT: It reviews the overall outcome of the patient after the hospital stay. It measures the effective skill of the doctors and the nurses and the hospital administration who were in close contact of the patient during admission. It measures the mortality and the morbidity.

MORTALITY: It is more definite and indisputable than the morbidity rates. It is measured during the period of hospital stay, so studies have shown that it underestimates the true mortality in a period of 30 days by 20%.

MORBIDITY: It is a valuable end point to assess the surgical skill of doctors and has implication in the quality of life of and also the effective use of health resources.[9]

RISK ADJUSTED ANALYSIS

Crude mortality and morbidity can be measured by simple collection of data of number of dead or injured only when the original population are identical. The true comparison can only be made if only risk adjusted analysis is used to allow differences in different units, hospitals and surgeons. It is mainly based on the principle identifying the variables that affect the mortality and morbidity like clinical condition of the patient and mode of presentation, also the nature and extent of severity of the surgery. An effective way to risk stratification is that to use a Bayesian model. This method allowed the probability of an event to revise as

additionalinformation was obtained. The Bayes model is tested in the much same way by using ROC curves and also the calibration curves.[13]

RISK SCORING IN SURGICAL PATIENTS

Scoring systems helps to quantify patient's risk of mortality and morbidity based on the severity of illness from the available data at an early stage of hospital stay. It is of particular importance in current surgical practice. Though there are number of scoring system that has been used to predict the morbidity in specific conditions like Ranson criteria for acute pancreatitis, Child pugh classification for liver failure, a more general scoring system when used can prove as a valuable tool to simplify comparative audit and research. A risk score obtained from an individual can be used to predict individual's prognosis or values obtained from a group of patients can be considered as a whole. If the score accurately predicts the individual's outcome, it can be used for decision making regarding the treatment and might be used in rationalizing resources. On the other hand scoring system that can be used to stratify group of patients according to the severity of their illness when implemented can be used as a meaning analysis of morbidity and mortality of that group.

PREOPERATIVE SCORES

The aim of these scoring system is to predict the risk of a particular patient before surgery. As most of the complications are related to cardiac and respiratory, and most deaths are due to cardiac complications specific system have been devised to predict the risk of such complication.

AMERICAN SOCIETY OF ANESTHESIOLOGISTS GRADING[10]

ASA Scores are devised in 1963 mainly for preoperative assessment and categorization of patients. Patients are categorized based mainly on medical history and physical examination without any specific investigations.

I. Normal healthy patients.

II. Mild systemic diseases.

III. Severe systemic diseases not incapacitating.

IV. Incapacitating systemic disease that is a threat to life.

V. Moribund, not expected to survive 24hrs with or without a surgery.

Adding prefix 'E' to any of the above denotes emergency surgery and signifies a poor prognosis. This is a simple yet effective scoring predicting mortality when used alone and it is already in use universally. Inter observer subjective errors are the limiting factor.[11]

APACHE SCORING

Acute physiological and chronic health evaluation score (APACHE) has been effectively used in critically ill patients. The aim of which is to allow classification of patients based on the severity of the illness to facilitate outcome of patients and new therapies and as an indicator of daily progress. The original APACHE scoring system has 34 variables which takes the poor values obtained in the first 24hrs of admission in ICU and also the state of chronic health condition. Recently this APACHE scoring has been modified to APACHE II[12] and APACHE III[13] which requires 12 and 18 variables respectively.

APACHE II has been validated as a simple scoring system in surgical intensive care with some results. Limitation of this is the requirement of more variables which has to be obtained over 24hrs after admission.

Pulmonary complication risk

In view of the fact that pulmonary complications are equally important like cardiac complication Lawrence et al. produced a model consisting of four preoperative variables which were associated with respiratory complications but this did not result in a standard score. The four variables areabnormal chest radiograph,abnormality in chest examination, Goldman's CRI and Charlson comorbidity index. This resulted in a score from 0-37 depending on the coexistent medical problems.

Prognostic Nutritional Index

Prognostic Nutritional Index {PNI} was devised with a aim to predict patient's risk of developing surgical complications based on nutritional status. Four factors used here are: serum transferring level, triceps skin fold thickness,serum albumin level, cutaneous delayed hypersensitivity. PNI correlates the development of postoperative sepsis and death that may be used for preoperative selection of patients who could benefit from the supplementary preoperative nutritional support.

Hospital Prognostic Index

This score uses criteria like presence of sepsis, malignancy, serum albumin level and delayed type hypersensitivity reactions.

Mortality Prediction Model

The Mortality Prediction Model **{**MPM} was first described in 1985 and now exists in several versions. The basis system asks several yes/no questions {emergency admission, surgical admission, resuscitation before admission, active malignancy, chronic renal failure, previous admission to intensive therapy unit, probable infection, coma} then considers age, heart rate, systolic blood pressure in a statistical model to calculate the risk of death in hospital.

Multiple organ failure prediction systems

Several systems have been derived to predict the outcome in critically ill patients with multiple organ failure including the Acute Organ System Failure {AOSF} score, the Multiorgan Failure {MOF} score and the Organ System Failure{OSF} score.

These systems allocate points for evidence of failure in five {AOSF} or seven {MOF and OSF} organ systems. Each of these and APACHE II scores has been compared in a surgical intensive care unit.

Sepsis scores

The Sepsis Score was designed to predict death in patients with sepsis. It ascribes points in four categories: local effects of tissue infection, pyrexia, secondary effects of sepsis, such as organ failure, and results of blood tests including blood culture. The score was a fairly good predictor of death in patients with sepsis, although in intraabdominal sepsis the APACHE II and the Mannheim Peritonitis Index were superior. Another score

devised for patients with sepsis is the Sepsis Severity Score which is similar to the seven-system organ failure score, and again proved to be a reasonable predictor of death. The Prognostic Index is a score specifically designed for patients with sepsis. Six factors are taken into account: age, pulse rate, serum albumin, potassium, cholesterol and blood urea nitrogen levels. It accurately predicts severity of illness and death in patients with gastrointestinal sepsis. Interleukin 6 and C-reactive protein levels were also predictive of death and it has been suggested that they should be included in future sepsis scores.

Trauma scores

The Trauma Score {TS} assesses five variables: respiratory rate and effort, systolic blood pressure, capillary refill and Glasgow Coma Score. It was initially based on a Triage Score and was intended to enable rapid evaluation of the trauma victim in the field. The Revised Trauma Score {RTS} considers only three of these variables, as capillary refill and respiratory rate were too subjective and difficult to assess if lighting conditions were not optimal. This revision yielded a substantially improved prediction of outcome. The Injury Severity Score {ISS} is an index of the severity and anatomical location of injury derived from the Abbreviated Injury Scale value for the three most severely injured body systems. The RTS and ISS have been combined, along with a measure of age and nature of injury, to form the Trauma Injury Severity Score {TRISS} which is widely used in trauma centres around the world. More recently a score based on the International Classification of Diseases {ICD} ninth revision codes has been

proposed {ICISS or ICD-9 Injury Severity Score}. As this is derived from data routinely collected in many hospitals it is easier to obtain.

Twenty-four hour intensive care unit point system

This score has three components: Glasgow Coma Score, oxygenation {as measured by the ratio of PaO2 to FiO2} and fluid balance. Points are allocated depending on the results obtained over the 24-h interval.

Therapeutic Intervention Scoring System

Therapeutic Intervention Scoring System {TISS} is a score that reflects the level of therapeutic intervention a patient requires in the intensive care unit. The score is obtained by summing up the points allocated to any of the possible 76 interventions that a patient may receive during 24 h. the system was designed for risk stratification rather than outcome prediction but it has shown to indicate an increased mortality rate if the score does not improve by the third day of treatment in the intensive care unit.

Pitfalls of possum scoring system

Mistakes do happen while collecting data and its analysis in possum scoring. Validity of possum has been questioned even though physiological and operative scores have been straight forward. First the physiological score of the patient can change with the time. Because a patient who is being resuscitated after admission will have an improved physiological score and the authors of original research recorded the values just before

the surgery. This problem can be overcome if all the surgeons record the values at the same time. Mellroy et al. reported that the preoperative resuscitation measures could improve physiology scores and overall outcomes were poor only in patients who failed to respond to initial resuscitation.

Missing data remains a problem. All variables are not required in all patients where a required variable if found to be normal by clinical examination and can be given the value of one.(presuming it to be normal). Electrocardiogram could be much more confusing if it has some nonspecific ECG changes which are negligible but have high scores.

A criticism of POSSUM is that it can be applied only to surgical patients ie only to those who have a surgery. Many authors have used the physiological component of the POSSUM score for some patients who did not have any surgical procedure. In a study conducted for this particular problem, 35110 surgical admissions were studied; the authors suggested a new regression equation that the predicted mortality in the same group irrespective of whether a surgery was performed or not. The authors thus suggested that this could beconsidered a national minimum data set for all surgical admissions. It has the advantage of including patients too sick to undergo a surgical procedure.

The physiology component of the POSSUM score has been evaluated in some non-surgical procedures. In a study of a group of patients who had undergone a thrombolysis procedure for acute leg ischemia, the POSSUM score(physiological) predicted mortality effectively. It is possible to predict the mortality in some surgical

procedures, using only the physiology score; some best prediction equations in vascular surgical procedures are obtained without employing the operative data {V-POSSUM and V-POSSUM physiology only}.

Cautious application of POSSUM

POSSUM has been modeled to predict the morbidity and mortality on follow up of patients only for 30 days. But there are procedures like endovascular aortic aneurysmal repair where mortality of the patient cannot be determined within 30 day period. POSSUM does not clear idea about the mid and the long term outcome of the patient.

Also the application of POSSUM physiological score in some non-operative procedures like barium enema as a measure of sickness is not valid as the procedure rarely causes any mortality in some patients. So application of POSSUM scoring on such condition should be used cautiously.

METHODS FOR RISK ADJUSTED ANALYSIS IN COMPARAIVE SURGICAL AUDIT.

A number of various methods have been proposed to standardize patient's data to permit a direct and meaningful comparison of outcome of patients irrespective of difference in population for auditing purpose.

POSSUM scoring system.

E-PASS: estimation of physiological ability and the surgical stress.

Surgical risk scale.

National veterans affairs surgical risk study.

All the above are useful for the surgical audit which use operative variables apart from the physiological scores.

POSSUM SCORING

A Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity was developed by G P Copland et al.Driven by the need to develop a simple risk scoring system applicable to diverse general surgical populations, whose main use would be in surgical audit, POSSUM scoring system was developed. It was first published in British Journal of Surgery March 1991; 78:356-360.

Copland et al conducted a prospective study over a period of six months in 1372 patients undergoing operation in general surgery units. It is an attempt to quantify the quality of surgical care and to allow comparison between different surgeons, units, hospitals and regions. Authors also stressed the usefulness of POSSUM as an adjunct to surgical audit.[14]

It is currently the most tested system for assessing outcomes by risk-adjusted analysis in the UK. It is simple, easy and applicable to all general surgical procedures. It is more popular in the North West of England, close to its original base, and has been adopted by a few enthusiasts across the world. A data base of 250,000 patients has apparently been

gathered. Surgeons seem to be generally more aware of POSSUM than anesthetists who regularly use ASA for general patients and APACHE for the critically ill. This is probably because most of the relevant publications have been in surgical journals. If ASA is considered to be too simplistic and highly subjective whilst APACHE is too complex for general use, then POSSUM neatly fits into the gap, requiring only 12 physiological and 6 operative facts, all easily available from routine admission and operation data.

Possum was developed as a tool to compare morbidity and mortality in a wide ranging basket of general surgical procedures and should be applied at the time of induction of anesthesia before operation to patients of all risk categories. However it is of relevance to mortality audits as an objective and qualitative assessment of risk in patients who died after surgery. Some Scottish surgical centers have taken an interest in POSSUM and took the opportunity of piloting POSSUM more widely at the same time.

COMPONENTS OF POSSUM

POSSUM scoring system consists of two parts of measuring 12 physiological and 6 operative parameters. Each of these parameters are given score ranging from 1-4 and are divide into 4 grades with an increase in the score. If a variable is not seen a score of one is given. The physiological scores are nothing but the signs and symptoms and the result of basic investigations. Changes in the chest radiograph is also taken into consideration in some variables.

Physiological **Operative parameters**

Age	Operative severity
Cardiac history	Multiple procedures
Respiratory history	peritoneal soiling
Pulse rate	Total blood loss
Blood pressure	Presence of malignancy
Hemoglobin	mode of surgery
White blood count	
Glasgow coma scale	
Serum urea	
Serum sodium	
Electrocardiogram	
Serum sodium	

With these variables scores are allotted to each patient minimal score being 12 and maximal being 88. With these scores predicted risk of mortality and morbidity can be calculated using complex equations.

P-POSSUM

In his article Whitely et al in 1996 showed that the original POSSUM regression equation failed to work in patients in Portsmouth.[15] He found that POSSUM over predicted

mortality of low risk patients in a study of 1485 patients. It was still possible to use the POSSUM y data set, but a different regression equation was needed. This regression equation became the Portsmouth predictor equation, or P-POSSUM. It used a different constant and weighted value for physiology and operative scores.

P-Possum used standard method of analysis described by Hosmer and Lemeshow. In this system, the risk applies to an individual.

A lively correspondence between the Portsmouth group and the originators of POSSUM appeared in British Journal of Surgery. The debate culminated in a direct comparison of the two possible methods of analysis. Wijisinghe et al explained how the original POSSUM equation used exponential analysis, while P-POSSUN used linear analysis. They employed both methods in a series of 312 patients who had vascular surgical procedure and showed that each was effective if appropriate analysis was used. Both scoring systems failed when the incorrect analysis was used.[16]

POSSUMIN GENERAL SURGERY

Since first published, POSSUM scoring system has been validated by many authors.Although this system is more popular around the North England in, many authors use it all over the worlds. A review article was published in 1999 annual report of SASM (Scottish Audit of Surgical Mortality) describing POSSUM scoring system. The aim of

that review was to increase the general awareness of POSSUM across Scottish surgeons and anesthetics.

It was recommended to include POSSUM in SASM forms during the following year for some surgical specialties. [17]

Possum also used in developing countries like India and Pakistan. A study conducted recently by R.S. Mohil and colleagues in India. In their study 120 patients who underwent emergency laparotomy in a single unit studied. Predicted mortality and morbidity rates were calculated by POSSUM and P-POSSUM equation using both linear and exponential method of analysis.When the linear method of analysis was used POSSUM over predicted morbidity, and there was a significant difference between the observed and predicted values (observed to expected (O: E) ratio 0.68). The prediction was more accurate when the exponential method was used (O: E ratio0.91). Possum also significantly over predicted mortality when analyzed by the linear method (O: E ratio 0.39), but the prediction improved when exponential analysis was used (O: E ratio 0.62). Applying linear and exponential analyses for P-POSSUM, the O: E ratios for mortality were 0.66 and 0.88 respectively. [4]

Another recently conducted study in center for the study of liver disease and department of surgery, university of Hong Kong, C.M. Lam and colleagues used POSSUM scoring systems for audit of major hepatectomy. A retrospective analysis was performed on data collected prospectively over a 6 year interval from January 1997 to December 2002.the mortality risk was calculated using POSSUM and the P-POSSUM equations. In this

study 259 patients underwent major hepatectomy. There were 6.6% postoperative deaths. On multivariate analysis only the physiological and operative severity scores were independent variables. The POSSUM system over predicted mortality (14.2%) and there was significant lack of fit in these patients. The mortality rate predicted by P-POSSUM was 4.2% and showed no significant lack of fit.[3]

In another study in academic department of surgery, king, s college hospital London, UK, Tekkis PP and colleagues studied risk-adjusted prediction of operative mortality in oesophagogastric surgery with O-POSSUM. This was designed to develop a dedicated oesophagogastric model for prediction of risk adjusted postoperative mortality in upper gastrointestinal surgery. Using 1042 patients undergoing esophageal surgery between 1994 and 2000, the Portsmouth predictor equation for mortality scoring system was compared with a standard logistic regression O-POSSUM model. The overall mortality was 12% (elective 9.4 and emergency 26.9).P-POSSUM over predicted mortality 14.5%, particularly in elective group of patients. The multilevel model offered higher discrimination than single level O-POSSUM and P-POSSUM models. When observed to expect outcomes were evaluated, the multilevel O-POSSUM model was found superior.[5]

R. Sutton, S. Sarin and Brooks compared the surgical risk score, POSSUM and p-POSSUM in higher risk patients. The aim of study was to compare the accuracy of mortality prediction using that of POSSUM and p-POSSUM in a cohort of higher risk patients. The surgical risk score (SRS) has been show equivalent accuracy but was validated using a cohort that contained a high proportion of patients. Some 949

inpatientsundergoing procedures in a district general hospital under the care of surgeon were analyzed. The observed mortality rate was 8.4%.mean mortality predicted by SRS, POSSUN and p-POSSUM were 5.9, 12.6, and 7.3% respectively.[6]

Gocmen E, Koc M and Tez M from fifth department of surgery, Ankara Numune Education and research hospital Turkey evaluated O-POSSUM and P-POSSUM scores in patients with gastric cancer undergoing resection. They studied retrospectively 126 patients undergoing elective resection in stomach cancer. They compared observed and predicted mortality using both these models. Overall fourteen deaths were observed-POSSUM predicted 15 deaths and P-POSSUM predicted 20.this data suggest that O-POSSUM predicts mortality more accurately than P-POSSUM.[18]

Mahesh Gopashetty, Gabriel Rodrigues and colleagues Evaluated P-Possum Mortality Predictor Equation and Its Use as a Tool in Surgical Audit. Patients admitted and operated over a period of four months in six general surgery units of Kasturba Medical College and Hospital, Manipal, India were included in the study. Copeland's scoring system was used to classify patients and the data was analyzed using P-POSSUM mortality equation. Predicted mortality rate was calculated and was compared with observed mortality rate. Results were evaluated by χ^2 test. A total of 493(n) patients were operated during this period of study. Of these, 103 patients underwent emergency surgeries. Among 493 patients operated, had a mortality of 26. The raw mortality rate in surgical unit II was 3.96% and 5.45% in unit VI. It was lowest in unit V (1.69%) and highest in unit IV (6.41%). After adjusting for risk, it was noted that Observed: Expected

mortality ratio was almost equal in unit II and unit VI (0.83 and 0.8 respectively), while it ranged from 0.66 in unit V to 1.25 in unit IV. It was also observed that mortality rates were not significantly different from predicted mortality rates. Thus, at the end of the study it was concluded that P-POSSUM mortality predictor equation predicts death accurately in general surgical patients. Comparing risk adjusted mortality rate is more meaningful than comparing "raw" mortality rate.[19]

POSSUM SCORING IN SPECIALTIES

COLORECTAL SURGERIES

Department of Surgery of Queen Mary Hospital, HONG-KONG, conducted a study from 1998 to 2002 for patients undergoing surgery for obstructed colorectal cancer. They examined the accuracy of (P-POSSUM) in predicting the mortality of patients. They attempted to analyze the actual mortality and the predicted P-POSSUM mortality of different surgical patients. 18 patients died postoperatively. There was no such major difference between the observed and predicted mortality. They concluded that P-POSSUM is valid in predicting overall mortality in high risk patients.

Another study was conducted in patients undergoing surgery for colorectal cancer by Watanabe and colleagues in Isaesaki hospital, Japan. Retrospective analysis of Physiological and operative severity scores in 119 patients undergoing elective and emergency colorectal surgery were recorded. Observed morbidity and also mortality were compared with the prediction by POSSUM or P-POSSUM using linear analysis. The POSSUM mortality equation overestimated deaths with this linear analysis. But the

mortality rate estimated by P-POSSUM did not differ significantly from the observed death rate. These results suggest that the POSSUM scoring system for morbidity risk must be modified, and the P-POSSUM scoring system for mortality risk is useful for patients undergoing colorectal surgery.

VASCULAR SURGERY

Derriford Plymouth, Midwinter M. J Tytherleigh., S Asheley used POSSUM and P-POSSUM to validate the mortality and morbidity of patients undergoing surgery in the vascular department of Derriford Hospital. Physiological and operative severity scaore of about 221 patients were studied who underwent elective and emergency arterial surgery. The POSSUM as with the other studies overestimated deaths but the mortality rate estimated by P-POSSUM was not significantly different from the observed death rate. The risk of morbidity predicted by POSSUM is not significantly different from the observed morbidity rate. They concluded that POSSUM combined with the P-POSSUM adjustment for death allows satisfactory prediction of the mortality rate and morbidity rates in patients undergoing surgery for vascular causes.

Sutton, Boyle and Prytherch did a study between august 1993 and July 2000 in patients with Abdominal Aortic Aneurysm (AAA). They did the study in 444 patients admitted for AAA both elective and emergency. They concluded saying that emergency cases are different from elective cases inthat emergency cases have their own risk factor.

PANCREATIC SURGERY

W. Pratt and S. Joseph, studied the predictive accuracy of POSSUM scoring in patients undergoing pancreatic resections (October 2001 and January 2007). They included about 326 patients (227 pancreaticoduodenectomies, 87 distal pancreatectomies, 7 central and 5 total pancreatectomies). . Logistic regression analysis were used to identify specific POSSUM parametersforprediction of postoperative morbidity.Observed and Expected morbidity ratioO/E ratio of 0.96. They concluded that POSSUM is one of the valuable perioperative scoring system for patients undergoing pancreatic resections and outcomes, and can be employed to guide the effective management decisions that impact postoperative recovery.

Abdaal W Khan, Sudeep R Shah and his colleagues from Royal Free and University college Medical school, London , UK evaluated the effectiveness of POSSUM scoring in pancreatic surgeries.they did a retrospective analysis in 50 patients. POSSUM and P-POSSUM equations were applied and the predicted results were compared with observed values. The actual mortality was 4% but the predicted mortality using POSSUM and P-POSSUM are 26% and 6% respectively. POSSUM like with previous studies overestimated morbidity and mortality for pancreaticoduodenectomies so modifications are needed prior to its application for a comparative audit in pancreatic surgery.[25]

ORTHOPEDICS SURGERY

A study was conducted in Queen's medical Centre, Nottingham in the department of orthopedics over a period of two years.. Complete data were collected from1164 patients and analyzed to compare the predicted mortality and the observed mortality by POSSUM. Risk of death wascalculated using the original POSSUM equation, with the modificationsto the operative score appropriate for orthopedic surgery. POSSUM predicted 181 (15.6%) deaths and observedmortality was 119 (10.2%).It should be used with caution whether for auditing purpose or for the preoperative triage.[28]

An article which was published bychinese journal of Traumatology in 2006 evaluated the effectiveness of POSSUM scoring in patients undergoing hip arthroplasty which showed a significant difference between two groups but an strong relation found between observed death and predicted death calculated by P-POSSUM.

GYNECOLOGICAL SURGERY

DAS N, TALAAT A. S in a article published in the European journal of surgical oncology, assessed POSSUM and its validity for use in gynecological oncology surgery. All patients who underwent gynecological oncology surgery at the Northern Gynecological Oncology Centre (NGOC) Gateshead, UK over a period of 12 months

(2002-2003) are assessed prospectively. Morbidity and mortality predicted by P-POSSUM were compared to actual outcomes. During this period 468 patients were analyzed. It predicted a 7% mortality rate while observed rate was only 2% (35 predicted deaths in comparison to 10 observed deaths), a difference that was significant statistically. They concluded that P-POSSUM overestimates the risk of mortality for gynecological oncology in patients undergoing surgery and it needs further modifications prior to the adoption for gynecological cancer surgery as a risk adjusted surgical audit tool.[29]

BARIATRIC SURGERY

Cagigas and Escalante studied the Application of POSSUM System in Bariatric Surgery.20 patients were taken up for the study and scored by the POSSUM system. All underwent elective bariatric surgery during the year 1997. All patients were scored at the time of surgery with the physiologic score and discharged with the operative severity score . The mean POSSUM score was 23.9. The mean physiological score was 13.95 (12-22), and the mean operative score was 9.4 (7-16). The distribution of patients were performed for BMI. The group with BMI 35-45 (n = 4 patients) had a mean POSSUM score of 22.75, a mean physiological score of 13.75, and a mean operative score of 9.0. The group with a BMI of more than 45 (n = 16 patients) had a mean POSSUM score of 24.18, a mean physiological score of 14.62, and a mean operative score of 9.5. The morbidities defined in the study was peritonitis and deep vein thrombosis and gastric fistula. All defined complications had similar POSSUM scores with different BMIs. No

mortality were observed. According to their experience, the POSSUM scoring system appears to provide an significant indicator of minor risk of morbidity and mortality in bariatric surgery with the vertical banded gastroplasty.[30]

OTOLARYNGOLOGY SURGERY

Department of ENT and Head and Neck Unit, University Hospital of Wales, studied applicability of POSSUM in head and neck surgery. They also applied the P-Possum (Portsmouth Possum) equation for mortality. They compared observed with the predicted outcomes. They introduced two new variables, radiotherapy and previous surgery to the operative site, to test their association with outcome. They found that Possum is valid for morbidity but predicts more accurately for high-risk than for low-risk groups. Neither Possum nor P-Possumaccurately predicts mortality.[31]

OESOPHAGOGASTRIC SURGERIES

Hisao Wakabayashi and his colleagues conducted a study which was retrospective and validated the usefulness of POSSUM scoring in predicting the mortality and morbidity of patients undergoing surgery for oesophagogastric surgeries in elderly patients. This study involved about 153 patients aged 75 and above who underwent elective gastric with or without colorectal surgery between period of July 2004 and June 2006. A retrospective analysis was performed where data was collected prior to each surgery. The predicted mortality and the morbidity rates were calculated using each of scoring systems and are used to obtain the observed/predicted (O/E) mortality and the morbidity ratios. New

logistic regression equations for mortality and morbidity were then calculated using the scores from the POSSUM scoring system and applied retrospectively. The O/E ratio for the morbidity obtained from POSSUM score was 0.23. The O/E ratios for the mortality from the POSSUM score was 0.15. Utilizing these new equations using scores from the POSSUM, the O/E ratio increased to 0.88. POSSUM equations over-predicted mortality and the morbidity in elective gastrointestinal surgery for malignant tumors in the elderly patients. However if a surgical unit make any appropriate calculations using their own patient series and update these equations, the POSSUM system can be of useful tool in the risk assessment of elderly patients undergoing surgery.[21]

POSSUM IN EMERGENCY SURGERIES

Sutton and Hobson, Leicester General Hospital, from the department of general and colorectal surgeries studied the comparison of POSSUM and PORTS MOUTH POSSUM with the clinical assessment of mortality following all emergency surgeries. Data were collected from all 163 patients prospectively. Physiological and operative severity scores were recorded for POSSUM and PORTS MOUTH POSSUM scoring system. The estimates of both the surgeon and the anesthetist for next 30 days and in hospital mortalities were also recorded preoperatively. Predicted mortalities were compared with the actual mortalities using linear and exponential analysis ROC curves were made.

PORTSMOUTH POSSUM gave the most accurate prediction of 30 day mortality using linear analysis [(O: E) ratio ie observed to expected ratio was 1.0]. POSSUM gave the most accurate prediction of mortality using exponential analysis (O: E ratio was 1.15).

Clinical judgment of the mortality from both operating surgeons and also anesthetists compared with the scoring systems for a period of 30 day (O: E ratio was 0.83 and O: E = 0.93, respectively). They conclude saying POSSUM and PORTSMOUTH POSSUM appear to be a useful indicator for the prediction of mortality. Clinical judgment compared with scoring systems in predicting post-operative mortality, but it may underestimate the mortality in very high-risk patients with more than 90% mortality.[32]

POSSUM IN PAKISTAN

QamarHafeezKiani et al conducted a study on the topic of Surgical Audit Using POSSUM Scoring System. A total of 500 case were studied. The scoring system provided the assessments for mortality and morbidity, which did not significantly differ from observed rates ($p<0.001$).The POSSUM score provided a reasonably effective means of achieving comparison among the two-thirds of patients who underwent surgical procedure. It was concluded that POSSUM provides a good assessment of the risk of mortality and morbidity in general surgical patients. This score can be effectively applied in all surgical setups in Pakistan and can be used as an adjunct to surgical and can be used as an adjunct to surgical audit.[33, 34]

COMPUTER PROGRAM FOR POSSUM AND CALCULATIONS

There is a computer software program freely available that can provide a single screen to calculate the POSSUM and PORTSMOUTH POSSUM mortality and morbidity risk .This is available on the website www.sfar.org/score2/P-POSSUM2.html .

POSSUM formula:

Mortality: "Ln (R/1-R) = -7.04 + (0.13 x physiological score) + (0.16 x operative severity score)"

Morbidity: "Ln (R/1-R) = –5.91 + (0.16 * physiological score) + (0.19 * operative score)"

P-POSSUM formula:

Mortality: "Ln R/1-R = -9.065 + (0.1692 x physiological score) + (0.1550 x operative severity score)"

Where R is predicted risk of mortality.

VALIDATION OF POSSUM AND P-POSSUM EQUATIONS

Observed and the expected outcomes, derived from both POSSUM and P-POSSUM equation were correlated by using Pearson correlation coefficient. The resultant of Pearson correlation is shown in tables. Pearson correlation coefficient(r) measures the strength of association between two variables

The value of r ranges between variables +1 and –1

+1=A positive(direct correlation)

-1=A negative(inverse correlation)

0=A zero correlation (no relationship)

Results are tested by Chi-square (X^2) test. Value of $P \leq 0.05$ is significant.

THE

STUDY

5. HYPOTHESIS:

Possum scoring system is a better risk stratification tool in predicting the mortality and morbidity of patients undergoing surgery for perforation peritonitis.Aim is to predict the risk of mortality and morbidity in patients with peritonitis due to hollow viscous perforation thereby evaluate the accuracy of POSSUM scoring systems in those patients. Assessment of surgical risk in these patients is to help in choosing the modality of post op management in a particular patient.

6. OPERATIONAL DEFINITIONS:

MORTALITY: Number of deaths within 30 days of surgery.

MORBIDITY:

Wound haemorrhage: Local haematoma requiring evacuation.

Deep haemorrhage: Postoperative bleeding requiring re-exploration.

Chest infection: Production of purulent sputum with positive bacteriological cultures, with or without chest radiography changes or pyrexia, or consolidation seen on chest radiograph.

Wound infection: Wound cellulites or the discharge of purulent exudates.

Urinary infection: The presence of $> 10^5$ bacteria / ml with the presence of white cells in the urine, in previously clear urine.

Deep infection: The presence of an intra-abdominal collection confirmed clinically or radiologically.

Septicemia: Positive blood culture.

Pyrexia of unknown origin: Any temperature above 37°C for more than 24 h occurring after the original pyrexia following surgery (if present) had settled, for which no obvious cause could be found.

Wound dehiscence: Superficial or deep wound breakdown.

Deep venous thrombosis and pulmonary embolus: when suspected, confirmed radiologically by venography or ventilation/ perfusion scanning or diagnosed at post mortem.

Cardiac failure: Symptoms or signs of left ventricular or congestive cardiac failure (alteration from preoperative measures).

Impaired renal function: Arbitrarily defined as an increase in blood urea of > 5mmol / l from preoperative levels.

Hypotension: A fall in systolic blood pressure below 90mmHg for more than 2 H as determined by sphygmomanometry or arterial pressure transducer measurement.

Respiratory failure: Respiratory difficulty requiring emergency ventilation.

Anastomotic leak: Discharge of bowel content via the drain, wound or abnormal orifice.

POSSUM:

Physiology and operative severity score for enumeration of morbidity and mortality.

P-POSSUM: PORTSMOUTH POSSUM.

7.MATERIALS AND METHODS:

SAMPLE SIZE:

50 patients with hollow viscous perforation admitted in Government Royapettah Hospital, Kilpauk Medical College Hospital from November 2014 to june 2015 were included in the study.

PERIOD OF STUDY:

Nov 2014 - June 2015

PLACE OF STUDY:

Department of general surgery in Government Royapettah Hospital, Kilpauk Medical College Hospital.

TYPE OF STUDY

Prospective study.

SAMPLE SIZE

50 patients.

INCLUSION CRITERIA:

Patients with clinical suspician and investigatory support for the diagnosis of peritonitis due to hollow viscous perforation who are later to be confirmed by intra operative findings.

EXCLUSION CRITERIA:

1. Patients with hollow viscous perforation due to trauma.

2. Patients with any other significant illness which is likely to affect the outcome more than the disease in study.

DATA COLLECTION:

Total 50 cases, who underwent emergency laparotomy for hollow viscous perforation. An informed consent was obtained from patients. Their demographic information's (age, sex, weight, etc) was recorded. The physiological variables like pulse rate, systolic blood pressure, respiratory rate, cardiac signs and Glasgow coma scale, hemoglobin, white blood count, Urea, Sodium, Potassium, ECG and CXR were recorded just before surgery. During the surgical procedure six operative variables including operative severity, total blood loss, multiple procedures, peritoneal soiling, cancer and mode of surgery were recorded by the operating surgeons. Their final physiological and operative score calculated from possum data sheet (attached). The predicted mortality and morbidity was calculated by POSSUM equation. After surgery the patient's observed mortality and morbidity were noted for one month and compared with the predicted outcomes. The patients were followed up for 1 month on 1st, 3rd, 7th, 15th, 30th post-operative days for morbidity (list attached in operational definitions) and mortality.

Data analysis:

All the information's gathered will be entered in the SPSS version 10.0 and analyzed. The source of the data will be 12 physiological variables i.e. age, pulse rate, systolic ,blood pressure, respiratory rate, cardiac signs, and Hb, W.B.C, Urea, Sodium, Potassium, and ECG & six operative variables i.e. operative severity, total blood loss, multiple procedures, peritoneal soiling, cancer and mode of surgery were recorded. Demographic variables of the patients included in this study were analyzed using the simple descriptive

statistics. Frequency distribution tables were made for source of data (emergency/elective). Final prediction of the mortality and morbidity of each patient was calculated using POSSUM calculator available on the internet and recorded. The observed mortality and morbidity was recorded within 30 days post-operatively and compared with predicted outcomes Mortality and morbidity tables were made to calculate the observed/predicted (O/P) ratios. Pearson correlation was used to correlate the observed and predicted morbidity and mortality. Chi-square analysis was made for the test of significance. A p-value of .05 or less was taken as significant.

8. RESULTS

The main cause for perforation leading to surgery was peptic ulcer 50%, Appendicular perforation 20%, enteric fever 10%, diverticulitis 7%,TB 7%, Strangulated hernia 3%, foreign body 3%.Mostly patients in emergency were male (88%). Mean age of the emergency patients was 36 years (SD $\pm$ 16.50) with age range from 15-75.

In emergency, sum of observed mortality and morbidity was 6(12 %) & 22(44%) while predicted mortality and morbidity by POSSUM was 9(18%) & 28.17(56.34%) and P-POSSUM 6(12%).The O/P ratio (observed / predicted) of mortality by POSSUM in laparotomy was .66 and for morbidity was .78 and by P-POSSUM, the mortality was 1.00.

Pearson's correlation for POSSUM observed and predicted morbidity was 1.000 &.736 and mortality was 1.00 & .707 and for P-POSSUM was 1.000 & .858.

There was no significant difference between the observed and predicted values for morbidity(x^2 =45.00, 24 df. p=. 006), for POSSUM mortality(x^2 =34.840, 20 df. p=. 021), and for P-POSSUM mortality(x^2 =104.160, 14 df. p=. 000)

TAB 1. INDICATIONS FOR LAPAROTOMY

Etiological factors causing perforation	**No. of patients**
Peptic ulcer	15
Appendicular perforation	6
Enteric fever	3
Tuberculosis	2
Diverticulum	2
Obstructed hernia	1
Foreign body	1

TAB 2: COMPLICATIONS FOLLOWING SURGERY

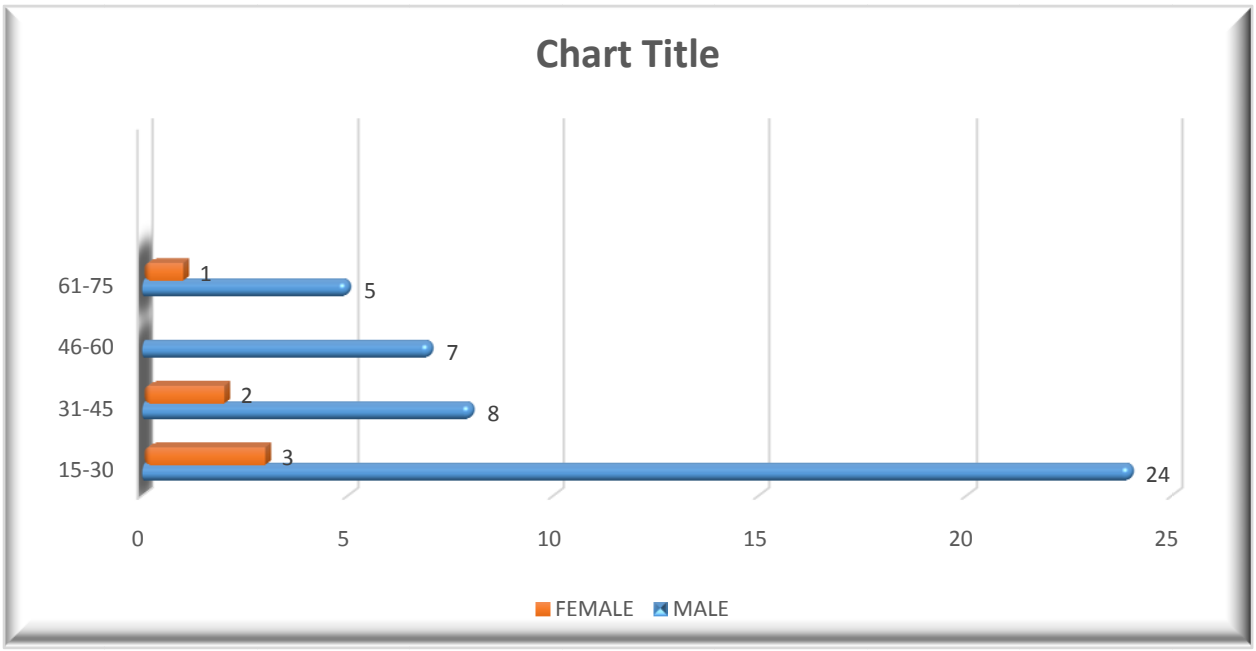
	Frequency
Wound infection	5(10%)
Anastomotic leak	2(4)%
Wound Dehiscence	3(6%)
Deep infection	2(4%)
Sepsis	1(2%)
Cardiac failure	1(2%)
Chest infection	1(2%)
Jaundice, Fistula	1(2%)
Urinary fistula	1(2%)
Pulmonary Embolus	1(2%)
Liver failure	1(2%)
Renal failure	1(2%)
Burst Abdomen	1(2%)
*UTI	1(2%)
Total	**22**

*UTI: urinary tract infection

TAB.3.AGE DISTRIBUTION

AGE IN YEARS	NO.OF CASES	PERCENTAGE
15-30	27	54%
31-45	10	20%
46-60	7	14%
61-75	6	12%
Total number of patients	50	100%

FIG 1. GRAPHICAL REPRESENTATION OF AGE AND GENDER DISTRIBUTION.



TAB 4. SEX DISTRIBUTION

SEX	NO.OF.CASES
Men	44
Women	6

FIG 2. GENDER DISTRIBUTION.

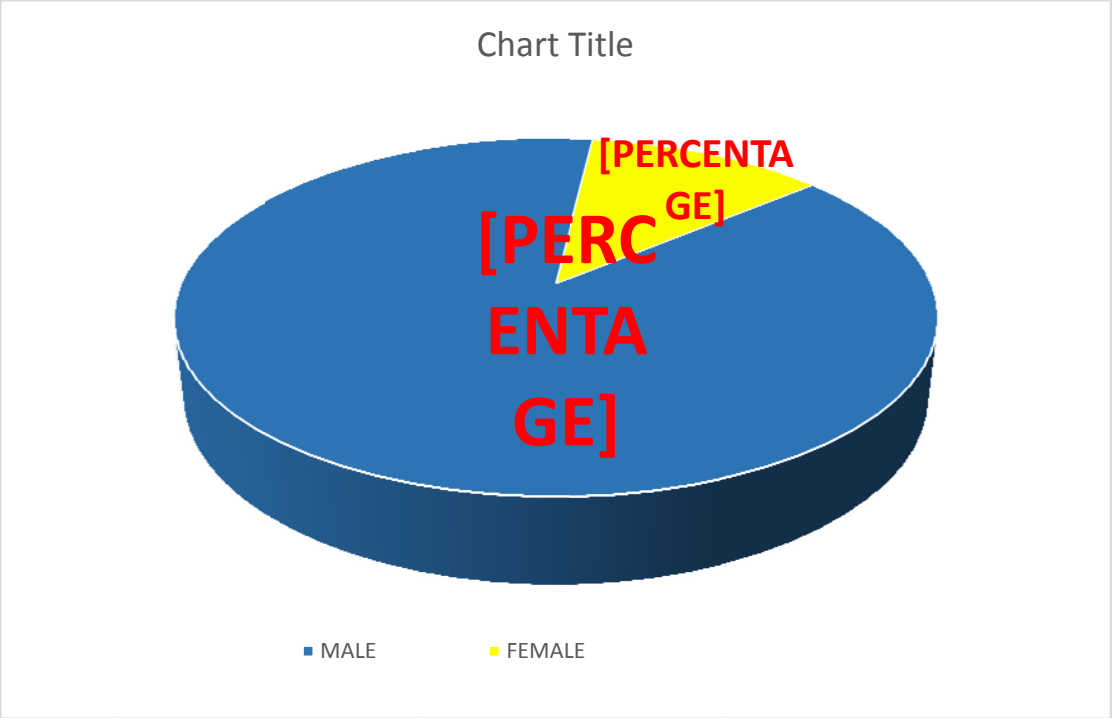


FIG 3. ETIOLOGICAL FACTORS

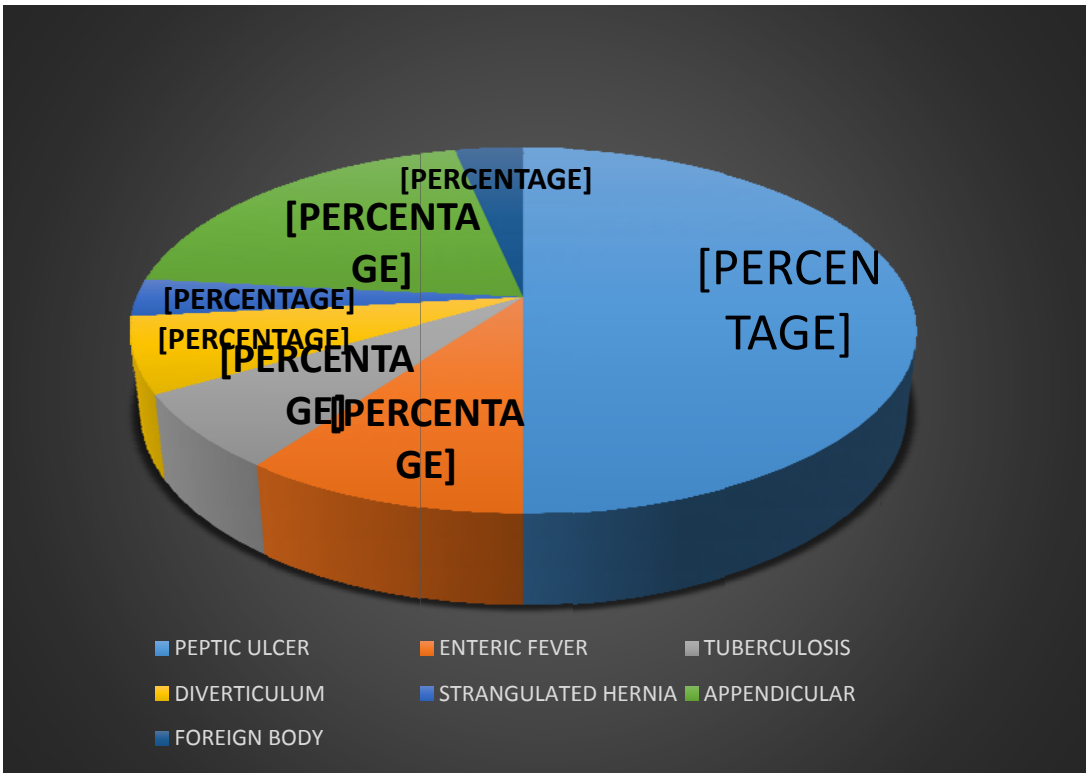
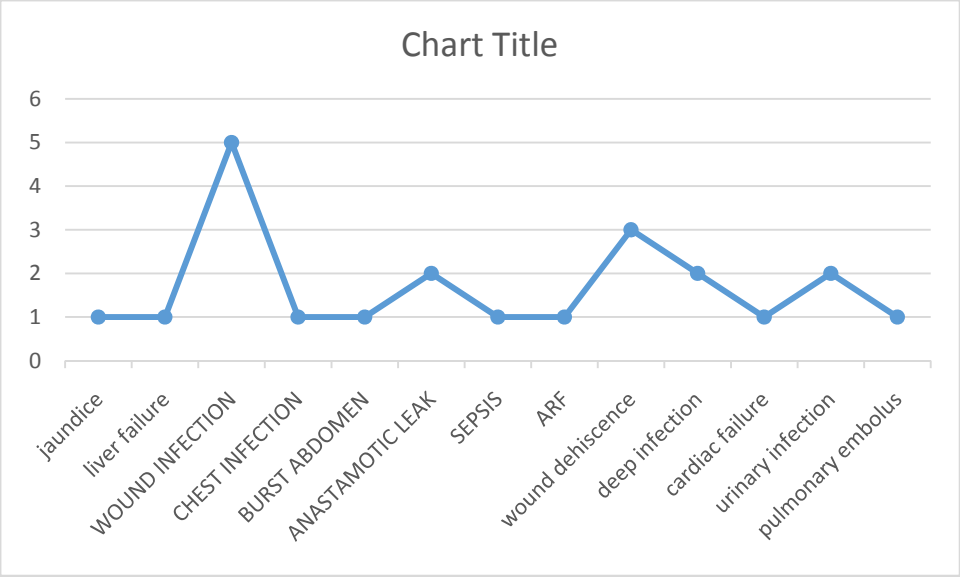


FIG 4. COMPLICATIONS FOLLOWING SURGERY



x-axis: complications

Y- axis: number of patients

TAB 5: SUM OF OBSERVED AND PREDICTED OUTCOMES

O.morb Sum	O.mort Sum	P.morb Sum	P.mort Sum	PP.mort Sum
22.00	6.00	28.17	9.00	6.00

Keys
O.mort: observed mortality

O.morb:observed morbidity

P.mort: predicted mortality by POSSUM

P.morb: predicted morbidity by POSSUM

PP.mort:predicted mortality by p-possum

TAB 6.COMPARISON OF OBSERVED AND PREDICTED MORTALITY USING POSSUM EQUATION.

RANGE OF AGE IN YEARS	FREQUENCY	O.MORT	P.MORT	O/P RATIO
15-30	27	1	4.45	.224
31-45	10	1	1.56	.64
46-60	7	0	0.36	0
61-75	6	4	2.63	1.52
	50	6	9	.66

Keys

O.mort: observed mortality

P.mort: predicted mortality by POSSUM

O/P : Observed/predicted

TAB 7.COMPARISON OF OBSERVED AND PREDICTED MORBIDITY USING POSSUM EQUATION

RANGE OF AGE IN YEARS	FREQUENCY	O.MORB	P.MORB	O/P RATIO
15-30	27	9	15.04	.59
31-45	10	5	5.15	.97
46-60	7	1	2.16	.46
61-75	6	7	5.82	1.20
	50	22	28.17	.78

Keys

O.morb:observed morbidity

P.morb: predicted morbidity by POSSUM

O/P : Observed/predicted

TAB 8.COMPARISON OF OBSERVED AND PREDICTED MORTALITY USING P-POSSUM EQUATION

RANGE OF AGE IN YEARS	FREQUENCY	O.MORT	PP.MORT	O/P RATIO
15-30	27	1	2.41	.41
31-45	10	1	.67	1.49
46-60	7	0	0	0
61-75	6	4	2.92	1.36
	50	*6*	*6*	*1*

Keys

O.mort: observed mortality

PP.mort: predicted mortality by P-POSSUM

O/P : Observed/predicted

TAB 9. PEARSON'S CORRELATION IN MORBIDITY

		Observed morbidity	**Predicted morbidity**
Observed morbidity	Pearson Correlation	1.000	.736
	Sig. (2-tailed)	.	.000
	N	50	50
Predicted morbidity	Pearson Correlation	.736	1.000
	Sig. (2-tailed)	.000	.
	N	50	50

** Correlation is significant at the 0.01 level (2-tailed).

TAB 10. PEARSON'S CORRELATION IN MORTALITY

		Observed mortality	**Predicted mortality**
Observed mortality	Pearson Correlation	1.000	.707
	Sig. (2-tailed)	.	.000
	N	50	50

TAB 11. PEARSON'S CORRELATION IN P-POSSUM MORTALITY

		Observed mortality	**Predicted mortality**
Observed mortality	Pearson Correlation	1.000	.858
	Sig. (2-tailed)	.	.000
	N	50	50
Predicted mortality	Pearson Correlation	.858	1.000
	Sig. (2-tailed)	.000	.
	N	50	50

** Correlation is significant at the 0.01 level (2-tailed)

9. DISSCUSSION

In this culture of increased scrutiny surgeons must be able to demonstrate clearly and accurately how they perform through comparative audit of mortality and morbidity rates. Thus audit of an individual surgeon, a unit or a hospital can be done simply by monthly meetings of mortality and morbidity or by many sophisticated scoring systems. POSSUM is such a scoring system which predicts mortality & morbidity.

The main cause for perforation leading to surgery was peptic ulcer 50%, Appendicular perforation 20%, enteric fever 10%, diverticulitis 7%,TB 7%, Strangulated hernia 3%, foreign body 3%.

Lam CM et al. reported the observed mortality rate in major hepatectomy 6.6% and POSSUM system over predicted mortality (14.2%).The mortality rate predicted by P-POSSUM was 4.2%.[3] This shows P-POSSUM is more accurate.

Tekkispp et al. reported that in oesophagogastric surgery O-POSSUM was superior.[5]

Sutton R et al. reported the observed mortality rate 8.4% while mean mortality predicted by SRS (surgical risk score), POSSUN and p-POSSUM were 5.9, 12.6, and 7.3% respectively.[6] This shows P-POSSUM is more accurate.

Gocmen E et al. reported that O-POSSUM predicts mortality more accurately than P-POSSUM.[18]

Mahesh G et al. also reported that P-POSSUM mortality predictor equation predicts death accurately in general surgical patients.[19]

Nagabhushsn S et al. also reported that in elective oesophagogastric cancer surgery, observed mortality was 32(10.2%) and P-POSSUM predicted 36 and O-POSSUM 49.They concluded neither model accurately predicted the risk of postoperativedeath. P-POSSUM provided a better fit to observed results thanO-POSSUM, which over predicted total mortality. P-POSSUM alsohad superior discriminatory power.[20]

Wakabayashi H et al. reported that in elective digestive surgery, the POSSUM system can be useful in the risk assessment for surgery in elderly patients.[21]

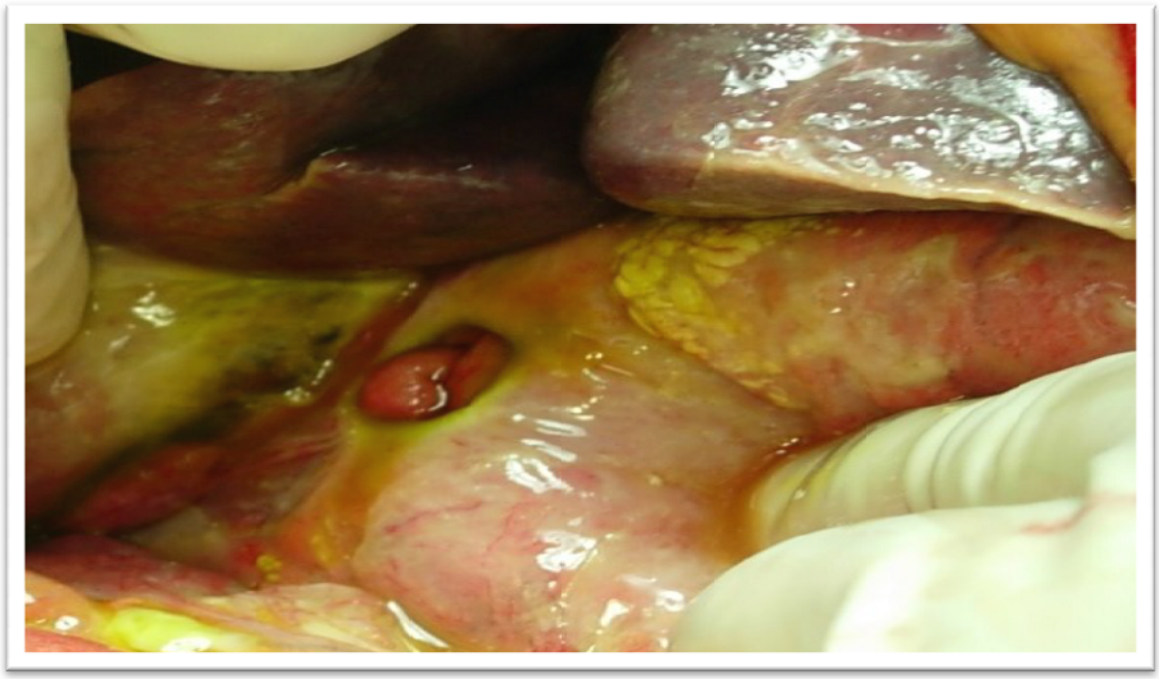
Jensen TC et al, Watanabe M et al, also found that in colorectal cancer surgery P-POSSUM predicted mortality well while POSSUM over-predicted mortality.[22, 23]

Pratt W et al. reported thatPOSSUM is a valuable perioperative scoring system for pancreatic resections and outcomes, and can be employed to guide management decisions that impact postoperative recovery.[24]

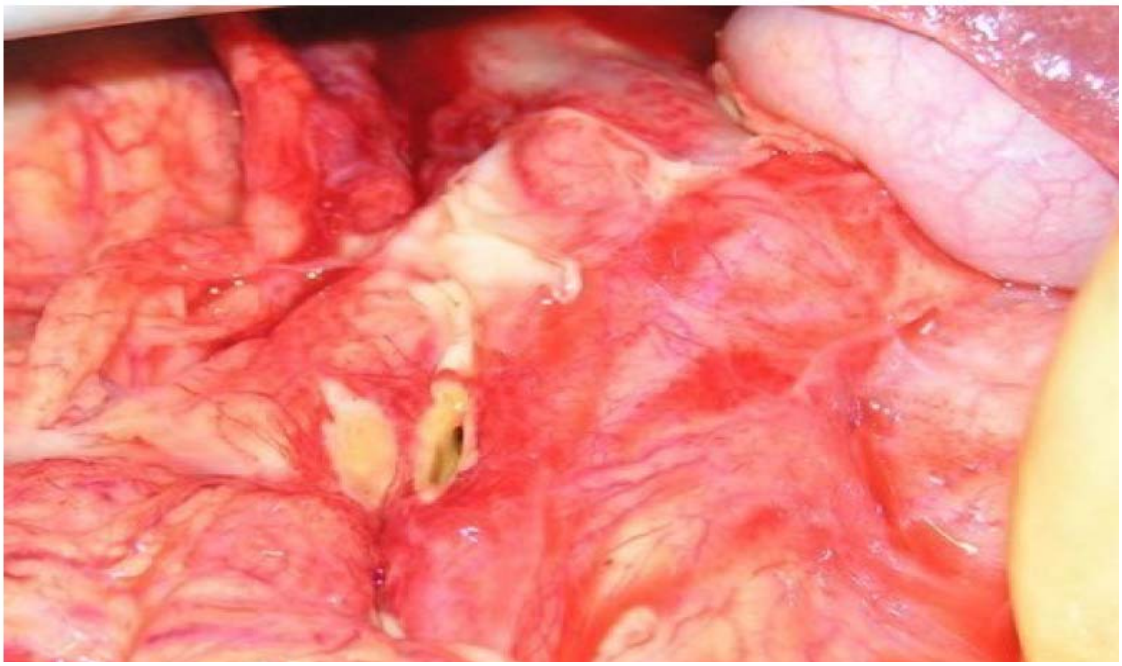
Abdul wk et al. also reported that The POSSUM-predicted mortality was 26%, and P-POSSUM predicted mortality was 6%, while actual mortality was 4%.Using POSSUM for morbidity, the predicted value was 76%. The observed morbidity was 46%. While P-POSSUM appeared satisfactory for predicting mortality risk; POSSUM overestimated morbidity and mortality for Pancreaticoduodenectomies in a specialist centre.[25]

Midwinter M et al, Khan AW et al, found that POSSUM over-predicted mortality while P-POSSUM predicted well.[26, 2]

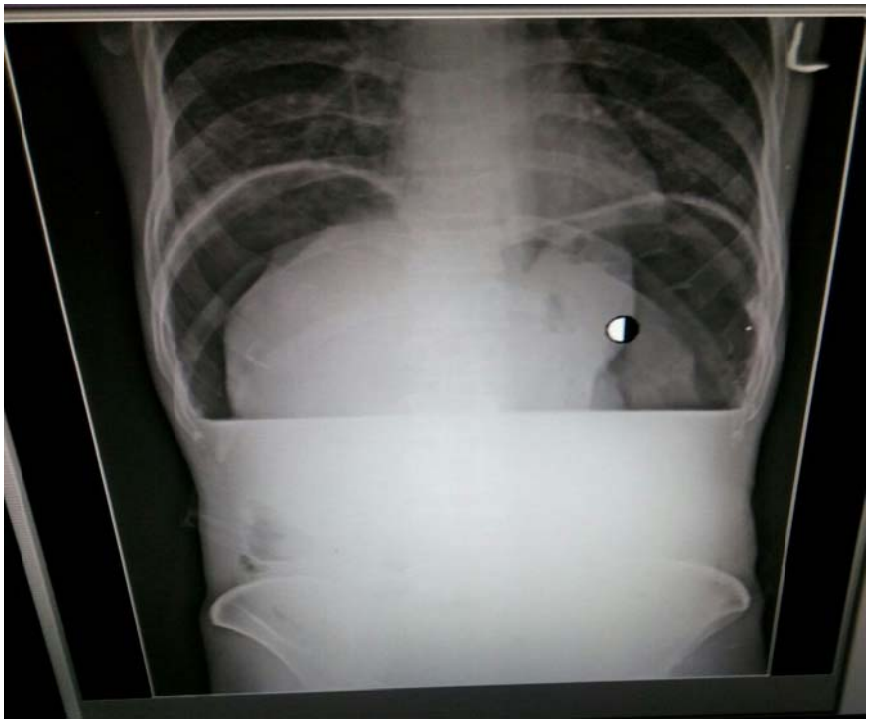
PERFORATED GASTRIC ULCER



PERFORATED DUODENAL ULCER

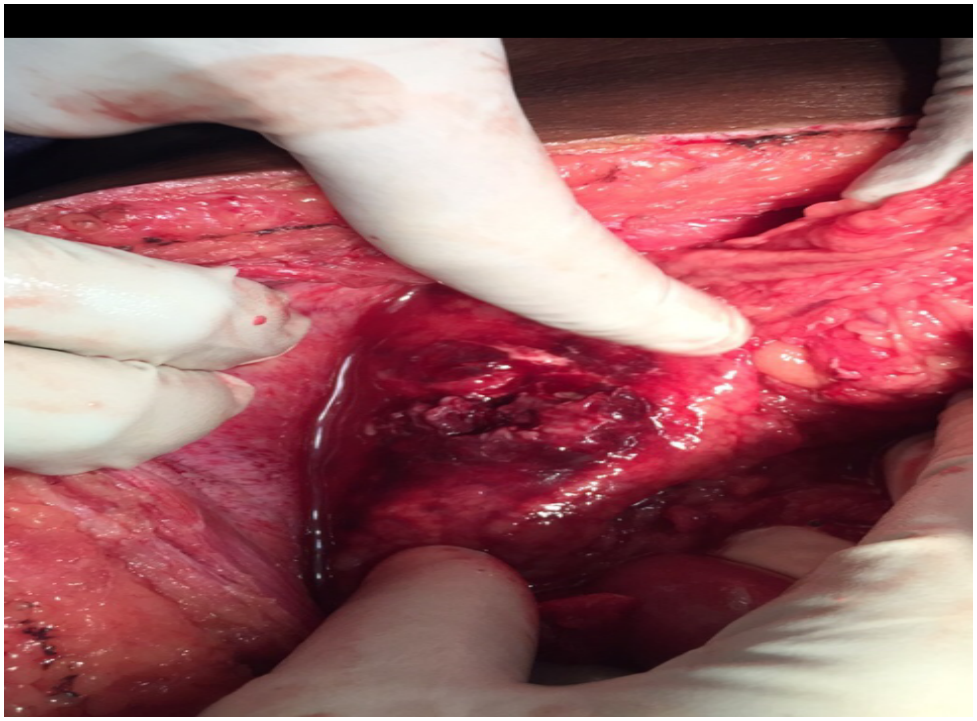


HUGE PNEUMOPERITONEUM IN DUODENAL PERFORATION



ILEAL PERFORATIO

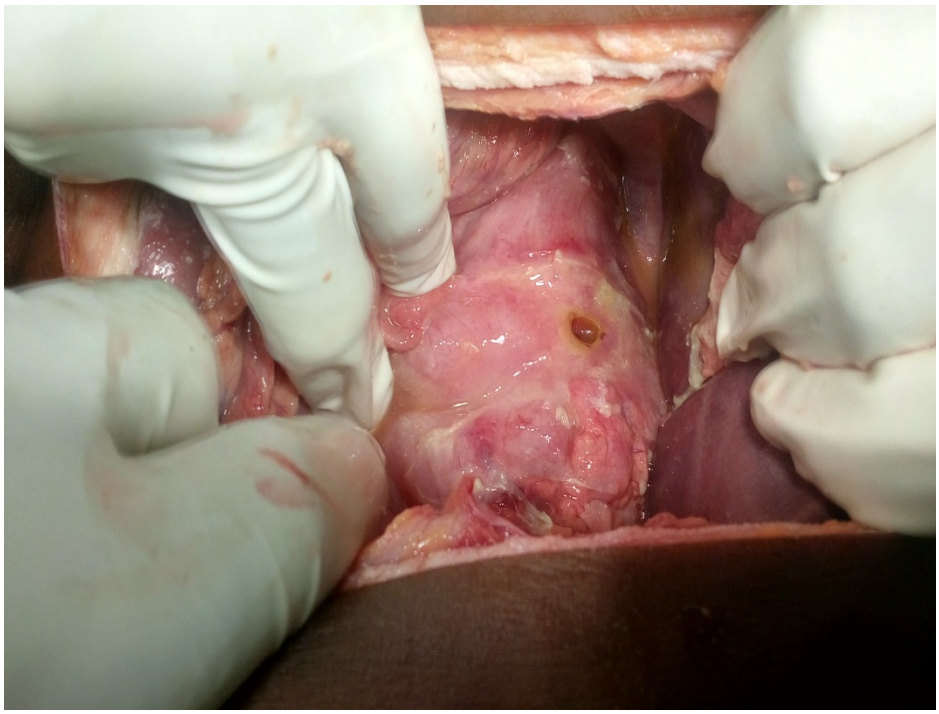
Caecal diverticular perforation



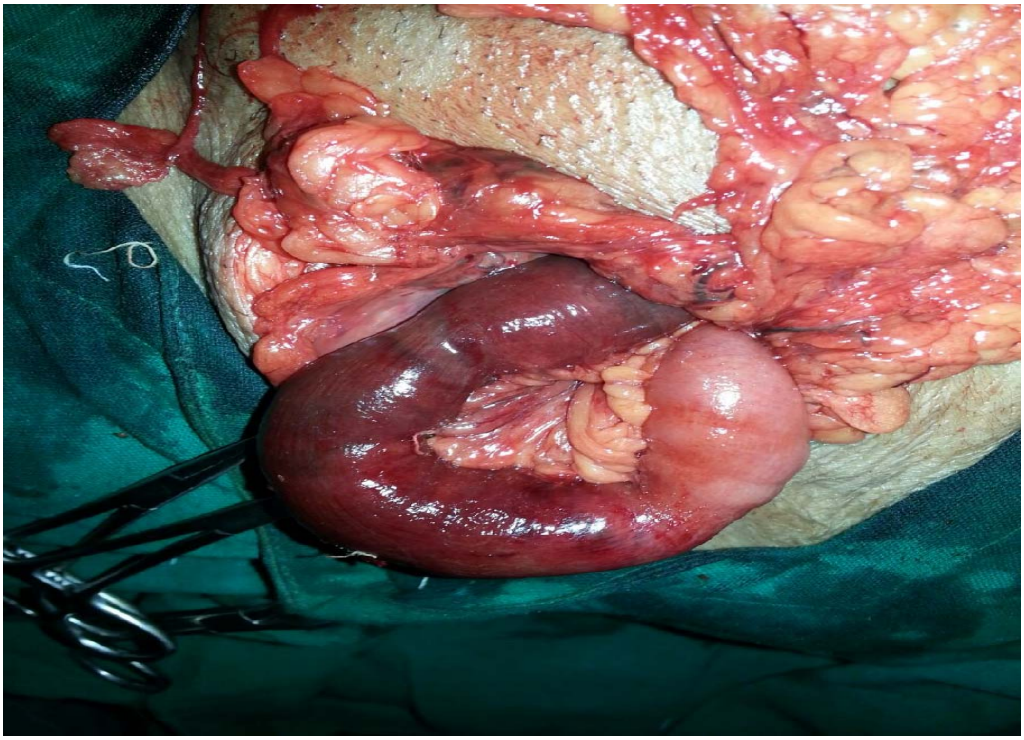
Fish bone perforation

APPENDICULAR PERFORATION WITH ABSCESS

Gastric perforation



PREOPERATIVE AND INTRAOPERATIVE PICTURES OF STRANGULATED FEMORAL HERNIA



BURST ABDOMEN

POST OPERATIVE ATELECTASIS

DUODENAL PERFORATION-INTRAOPERATIVE PICTURE

POST OPERATIVE WOUND INFECTION OF SAME PATIENT

ANASTAMOTIC LEAK

10. Conclusion:

Based on my study, POSSUM can be used as a good stratification tool for predicting morbidity and mortality within 30 days from the operative day. One of the limitation in POSSUM is that it over predicts mortality in some low risk patients but prediction of morbidity is better. POSSUM scoring system is well validated for its use in risk adjusted auditing in general surgery.

With this scoring system the outcome of the patient can be predicted and pre-operative counselling of the patient can be done. Not only that the care takers can be informed prior as a part of the informed consent and can be used for evaluation of the technique of pre-optimization in high risk patients. This study shows that although POSSUM over predicts the mortality in some low risk patients it is a good method of evaluation. Also P-POSSUM predicts the mortality in which is the major limiting factor POSSUM. This system can be applied for the surgical audit in our set up.

11. BIBILIOGRAPHY

1. Mouret P, Francois Y, Vignal J, et al: Laparoscopic treatment of perforated peptic ulcer. Br J Surg 77:1006, 1990

Nathansom LK, Easter DW, Cuschieri A. Laparascopic repair/per toilet of perforated duodenal ulcer. Surgical Endoscopy 1990, Vol 233.

L aparoscopic Plication of Perforated **Duodenal Ulcer**
Laparoscopic Plication of Perforated **Duodenal Ulcer**. **…**Nathansom LK, Easter DW, Cushieri

A. Laparascopic repair/peritoneal toilet of perforated **duodenal ulcer. …**

Aboutplastic.surgery.uiowa.edu/surgery/ physpubs/lapofperforatedulcer.html – 13k – Cached - Similar pagE

2. Smith J J, Tekkis P. Risk Prediction in Surgery [online] 2003.available from URL:http://www.RiskPrediction.org.uk

3. Lam CM, Fan ST, Yuen AWC, Law WL, and Poon K. Validation of Possum scoring system for audit of major hepatectomy. Brjsurg 2004; 91: 450-4.

4. Mohil RS, Bhatnagar D, Bahadur L, Rajneesh, Dev KD, Magan M. Possum and P-Possum for risk adjusted audit of patients undergoing emergency laparotomy. Brjsurg r2004; 91: 500-3.

5. Tekkis PP, McCuloch P, Poloniecki JD, Prytherch DR, kessaris N, Stegar AC. Risk adjusted prediction of operative mortality in oesophagogastric surgery with O. Possum. Brjsurg 2004; 91: 288-95.

6. Brooks MJ, Sutton R, Sarin S. Comparison of surgical risk score, possum and p-possum in higher-risk patients. Brjsurg 2005; 92:1288-92.

7. Emberton M, Meulen J V D. an approach to surgical audit. In: Russell R C G, Norman S, Christopher JK editors. Bailey & Love's short practice of surgery. 24th ed. London: Arnold publishers 2004; 239-245.

8. Davidson, Schneider H J. Audit. In: Kirk RM, Ribbons WJ editors. Clinical surgery in general. Fourth ed. London: Churchill Livingstone publishers 2004; 428-435.

9. Goldacre MJ, Griffith M, Gill M, Mackintoch A. In-hospital deaths as a friction of all deaths within 30 days of hospital admission for surgery. Analysis of routine statics. BMJ 2002; 324:1069-70.

10. ANONYMOUS: NEW Classification of PHYSICAL Status. Anesthesiology 1963; 24:111.

11. Vacanti CJ, Houstn RJV, Hill RC. A statistical analysis of the relationship of post operative mortality in 63388 cases. Anesth Analog 1970; 49: 564-6.

12. Knauswa, Draper EA. Wagner DP. Zimmermam JE. APACHE II: a severity of disease classification system. Crit Care Med 1985; 9: 818-29.

13. Knauswa, Draper EA. Wagner DP. Zimmermam JE. APACHE III prognostic system. Risk prediction of hospital mortality for critically ill hospitalized adults. Chest 1991; 100:1619-36.

14. Copeland GP et al. POSSUM: a scoring system for surgical audit. Br J Surg1991; 78: 356-60.

15. Whiteley DR et al. An evaluation of the POSSUM surgical scoring System. Br J Surg, 1996; 83: 812-15.

16. Wijesinghe D et al. Comparison of POSSUM and the Portsmouth Predictor equation for predicting death following vascular surgery. Br J Surg 1998; 85:209-12.

17. Annual report 1999, Scottish Audit of Surgical Mortality

18. Gocmen E, Koc M, Keskek M, Kilie M, Ertan T. Evaluation of p-possum and o-possum in patients with gastric cancer undergoing resection.Hepatogastroentrology 2004; 51:1864-6.

19. Mahesh G, Gabriel R, Sunil K. Evaluation of P-Possum Mortality Predictor Equation and Its Use as a Tool in Surgical Audit. The Internet Journal of Surgery 2003; Volume 5 Number 1

20. Nagabhushan S,Srinath S, Weir F,AngersonW J, SugdenB A,Morran C G. Comparison of P-POSSUM and O-POSSUM in predicting mortality after oesophagogastric resections.Postgrad Med J 2007; 83: 355-58.

21. Wakabayashi H, Sano T, Yachida S, Okano k. Validation of risk assessment scoring systems for audit of elective surgery for gastrointestinal cancer in elderly patients. International journal of surgery 2007; 5: 323-27.

22. Jensen TC, Bosco C, LAWL. Evaluation of P-POSSUM in surgery for obstructing colorectal cancer and correlation of the predicted mortality with different surgical options. Diseases of the colon & rectum 2005; 48: 493-98.

23. Makoto W, Naokuni Y, Tomokazu Osamukamisaka N, Mitsuo T. Estimation of Mortality and Morbidity Risk in Colorectal Surgery using POSSUM Predictor Equation. Japanese Journal of Gastroenterological Surgery 2004; 37: 1714-20.

24. Pratt W, Joseph S, Callery M, Vollmer C. POSSUM accurately predicts morbidity for pancreatic resection. Surgery; 143:8-19.

25. Khan AW, Shah SR, Agarwal AK, Davidson BR. Evaluation of the POSSUM Scoring System for Comparative Audit in Pancreatic Surgery**.**Dig Surg 2003; 20: 539-45

26. Midwinter M J, Tytherleigh M,Ashely S.Estimation of mortality and morbidity risk in vascular surgery using POSSUM and the Portsmouth predictor equation. Brjsurg 1999; 86: 471-74

27. Prytherch DR, Sutton GL, Boyle JR. Portsmouth POSSUM models for abdominal aortic aneurysm surgery. Br J Surg. 2001; 88: 958-63.

28. Ramanathan TS, Moppett IK, Wenn R, Moran CG**.** POSSUM scoring for patients with fractured neck of femur.BJA2005; 94: 430-33.

29. Das N, Tallat AS, Naik R, Lopes AD, Godfrey KA, Hatem MH, Edmondson RJ. Risk adjusted surgical audit in gynecological oncology: P-POSSUM does not predict outcome. EJ SurgOnc 2006; 32: 1139-43.

30. Cagigas J, Escalante C, Angelo A, Hernandez. Application of the POSSUM System in Bariatric Surgery. Obesity Surgery 1999; 279-81.

31. Griffiths H,Cuddihy P, Davis S,Parikh SA,Tomkinson. Risk-adjusted comparative audit. Is Possum applicable to head and neck surgery? Clin Otolaryngology & Allied Sciences 2002; 27: 517-20.

32. Hobson S A,Sutton C D, Garcea G, Thomas W M. Prospective comparison of POSSUM and P-POSSUM with clinical assessment of mortality following emergency surgery. Actaanaesthesiologicascandinavica 2007; 51: 94-100.

33. Kiani QH, Hanif N, Khan MM. Surgical audit using Possum scoring system. J Surg Pak 2004; 9: 15-20.

34. Jawaid M, Masood Z, Iqbal SA. Postoperative complications in general surgical ward of teaching hospital. Pak J Med 2006; 22:171-5.

35. Joosse P, Soedarmo S, Luitse JS, Ponsen KJ.Trauma outcome analysis of a Jakarta University Hospital using the TRISS method: validation and limitation in comparison

with the Major Trauma Outcome Study. Trauma and Injury Severity Score.J Trauma 2001; 51:134-40.

36. Talwar S, Jain S, Porwal R, Laddha BL, Prasad P. Trauma scoring in a developing country. Singapore Med J 1999; 40: 386-8.

37. Qureshi MA. Polytrauma epidemiology & prognosis versus trauma score. Professional Med J 2006; 13: 57-62.

38.Aharonson-Daniel L, Giveon A, Stein M; Israel Trauma Group (ITG), Peleg K. Different AIS triplets: Different mortality predictions in identical ISS and NISS. J Trauma 2006; 61: 711-7.

39. Nijboer JM, van der Sluis CK, van der Naalt J, Nijsten MW, Ten Duis HJ. Two cohorts of severely injured trauma patients, nearly two decades apart: unchanged mortality but improved quality of life despite higher age.J Trauma 2007; 63: 670-5.

40. Edward J. Hanrahan, GangadharMadupu.Epidemiology and Biostatistics for USMLE. 1st ed. USA: Appleton & Lange; 1994.

41. Prytherch DR, Whitely MS, Higgins B, Weaver PC, Prout WG, Powell SJ. Possum and Portsmouth Possum for predicting mortality. Br J Surg 1998; 85:1217-20.

42.Whitely MS, Prytherch DR, Higgins et al. An evaluation of the Possum surgical scoring system. Br J Surg1996; 83: 812-15.

43. Sagar PM, Harthy MN, Mancey et al. Comparative audit of colorectal resection with the POSSUM scoring system.

Br J Surg 1994; 81:1492-94.

PROFORMA

EVALUATION OF PHYSIOLOGIC AND OPERATIVE SEVERITY SCORE FOR ENUMERATION OF MORTALITY AND MORBIDITY IN PATIENTS UNDERGOING SURGERY FOR HOLLOE VISCOUS PERFORATION.

Case no # Registration no# Date#

Name of patient# Age# Sex#

Socio economic status#

Weight# Profession#

Provisional diagnosis#

Final diagnosis#

Mode of admission # Site of perforation #

POSSUM DATA SHEET PHYSIOLOGICAL SCORE

	1	2	4	8
AGE	<60	61-70	>71	
Cardiac sign + CXR	no failure	diuretic, digoxin, anti-anginal or anti-hypertensive	peripheral oedema warfarin borderline cardiomegaly	raised JVP cardiomegaly
Respiratory History +CXR	no dyspnoea	dyspnoea on exertion	limiting dyspnoea (one flight) moderate COAD	dyspnoea at rest RR>30min fibrosis or consolidation
Blood pressure (Systolic mmHg)	110-130	131-170 100-109	>171 90-99	<90
Pulse (Beats/min)	50-80	81-100 40-49	101-120	>121 <40
Glasgow coma	15	12-14	9-11	<8

scale				
Haemoglobin g/100ml	13-16	11.5-12.9 16.1-17.0	10.0-11.4 17.1-18.0	<9.9 >18.1
White cell count (x1012/L)	4-10	10.1-20.0 3.1-4.0	>20.1 <3.0	
Urea (mmol/L)	<7.5	7.6-10.0	10.1-15.0	>15.1
Sodium (mmol/L)	>136	131-135	126-130	<125
Potassium (mmol/L)	3.5-5.0	3.2-3.4 5.1-5.3	2.9-3.1 5.4-5.9	<2.8 >6.0
ECG	Normal		Atrial fibrillation (rate 60-90/min)	any abnormal rhythm >5 ectopics / min, Q waves ST/T wave changes

POSSUM DATA SHEET OPERATIVE SEVERITY SCORE

	1	2	4	8
Operative severity score	MINOR	MODERATE	MAJOR	MAJOR +
Multiple procedures	1		2	> 2
Total blood loss (mls)	< 100	101-500	501-999	>999
Contamination	None	Minor (serous fluid)	Local pus	Free bowel content, pus or blood
Presence of malignancy	None	Primary only	nodal metastases	Distant metastases
Mode of surgery	Elective		Emergency Resus>2hrPossible op <24 hrs after admission	Emergency (Immediate surgery < 2hrs needed

Possum score: Physiological _____ Operative:

OBSERVED MORBIDITY:

Complications	1st day Y/N	3rd day Y/N	7th day Y/N	15th day Y/N	30th day Y/N
♦ Wound hemorrhage					
♦ Deep hemorrhage					
♦ Chest infection					
♦ Urinary infection					
♦ Wound infection					
♦ Deep infection					
♦ Septicemia					
♦ Pyrexia of unknown origin					
♦ Wound dehiscence					
♦ DVT and P. Embolus					
♦ Cardiac failure					
♦ Impaired renal function					
♦ Hypotension					

♦ Respiratory failure					
♦ Anastomotic leak					

POSSUM (Physiologic and Operative Severity Score for the enumeration of Mortality and Morbidity)

Age	Glasgow	Respiratory
Urea	Pulse (beats/min)	Cardiac signs
Hb (g/dL)	W.B.C.	ECG
Potassium (mEql/L)	Sodium (mEql/L)	Systolic Blood Pressure
Physiologic Score		
Operative Severity	Multiple procedures	Total Blood Loss
Peritoneal soiling	Cancer	Mode of surgery
Predicted Morbidity Rate (Definitions are following)		Predicted Mortality Rate
x = (0.16* physiologic score)+(0.19*operative score)- 5.91		y=(0.13* physiologic score)+(0.16*operative score)-7.04

Predicted Morbidity Rate= $1/(1+e^{(-x)})$	Predicted Mortality Rate= $1/(1+e^{(-y)})$

Portsmouth – POSSUM

(Physiologic and Operative Severity Score for the enumeration of Mortality andMorbidity)

Age	Glasgow	Respiratory
Urea	Pulse (beats/min)	Cardiac signs
Hb (g/dL)	W.B.C.	ECG
Potassium (mEql/L)	Sodium (mEql/L)	Systolic Blood Pressure
Physiologic Score		
Operative Severity	Multiple procedures	Total Blood Loss
Peritoneal soiling	Cancer	Mode of surgery
Operative Score		
Predicted Death Rate	R= (0.1692 * physiologic score)+(0.1550 *operative score)-9.065 Predicted Death Rate= 1 / (1+ $e^{(-R)}$)	

MASTER CHART

S.NO.	NAME	AGE/SEX	IP:NO	DIAGNOSIS	P.score	O.score
1	Thiyagarajan	27/M	24973	Duodenal perforation	24	19
2	Arjun	29/M	25611	Foreign body perforation	16	20
3	Sukumar	29/M	23768	Duodenal perforation	17	15
4	Muralidhas	45/M	30021	Duodenal perforation	17	17
5	Suresh	25/M	22258	Duodenal perforation	16	13
6	Chinnaduari	59/M	26509	TB abdomen	40	25
7	Elumazhi	30/M	35879	Gastric perforation	23	21
8	Prabhu	28/M	28833	Duodenal perforation	22	13
9	Venkatesh	27/M	31910	Appendicular perforation	16	20
10	Krishnamoorty	37/M	21818	Caecal diverticular perforation	18	17
11	Ramu	30/M	27544	Duodenal perforation	16	17
12	Kushal	64/M	24098	TB abdomen	16	11
13	Surya	29/M	30087	Appendicular perforation	22	13
14	Ramu	41/M	29938	Duodenal perforation	24	19
15	Narayanan	29/M	31154	Duodenal perforation	18	19
16	Babu	39/M	31565	Enteric fever perforation	15	16
17	Amudhavalli	66/F	22249	Obstructed hernia	20	12
18	Dayalan	48/M	27171	Diverticular perforation	16	12
19	Ganesan	29/M	32077	Duodenal perforation	22	13
20	Gunalakshmi	45/F	31609	Enteric fever perforation	24	19
21	Hariharan	36/M	32976	Duodenal perforation	15	23
22	Ramanadhan	40/M	28460	Enteric fever perforation	22	13
23	Ashwini	19/F	23545	Appendicular perforation	16	20
24	Prabhu	42/M	26968	Duodenal perforation	20	26
25	Selvam	46/M	21575	Gastric perforation	40	23
26	Ranjini	22/F	25673	Appendicular perforation	24	16
27	Murugan	29/M	35623	Duodenal perforation	18	23
28	Ramesh	29/M	32976	Appendicular perforation	21	24
29	Ismail	28/M	23675	Appendicular perforation	16	20
30	subbaiyyah	29/M	28798	Duodenal perforation	24	19
31	sarasu	44/F	34889	Appendicular perforation	23	19
32	Lakshmi	40/F	24098	Appendicular perforation	18	23
33	Babu	28/M	39820	Appendicular perforation	18	20
34	Chellappan	66/M	34626	Duodenal perforation	16	20
35	Guruprasad	48/M	25061	TB abdomen	24	16
36	Hari	23/M	26454	Enteric fever perforation	22	13

37	Rajendran	70/M	38654	TB abdomen	24	12
38	karthik	30/M	25376	Duodenal perforation	16	20
39	Jayavel	46/M	34786	Duodenal perforation	18	16
40	Palani	26/M	25670	Enteric fever perforation	22	12
41	Thangavel	43/M	40919	Duodenal perforation	16	12
42	Murugeswaran	62/M	33756	TB abdomen	15	18
43	Thanigaiarasu	30/M	32409	Duodenal perforation	14	19
44	Venkatesh	49/M	43256	Enteric fever perforation	16	19
45	Subramani	22/M	20013	Foreign body perforation	22	16
46	Chellaya	20/M	33834	Appendicular perforation	18	20
47	Govindan	61/M	27016	Caecal diverticular perforation	16	12
48	manikandan	22/M	28736	Appendicular perforation	30	22
49	Syed ali	29/M	35665	Duodenal perforation	20	16
50	Muthukumar	30/M	27465	Enteric fever perforation	18	12

P.Score- Physiological score

O. Score- Operative Score

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு :

IR GHT ILIAC FOSSA MA S : A CLINICAL STUDY

ஆராய்ச்சி நிலையம் : பொது அறுவை சிகிச்சைத் துறை
கீழ்பாக்கம் மருத்துவக் கல்லூரி
சென்னை – 600 010.

பங்கு பெறுபவரின் பெயர் : வயது :

பங்கு பெறுபவரின் எண். :

பங்கு பெறுபவரது இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களைப் பெறவும் வாய்ப்பளிக்கப்பட்டது. ☐

நான் இவ்வாய்வின் தன்னிச்சையாகத்தான் பங்கேற்கிறேன். எந்தக் காரணத்தினாலோ எந்தக் கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகிக் கொள்ளலாம் என்று அறிந்து கொண்டேன். ☐

இந்த ஆய்வு சம்மந்தமாகவோ, இதைச் சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும்போது இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளைப் பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன். ☐

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான முடிவுகளையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக் கொள்ளவும் அதைப் பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கிறேன். ☐

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்குக் கூறப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன், இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்றும் உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராத நோய்க்குறி தென்பட்டாலோ உடனே அதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன். ☐

பங்கேற்பவரின் கையொப்பம் .....இடம் ..... தேதி
கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

ஆய்வாளரின் கையொப்பம் ..... இடம் ..... தேதி

ஆய்வாளரின் பெயர் .....

" **POSSUM SCORING IN HOLLOW VISCUS PERFORATION**"